

**VIVAX MALARIA PATIENTS AND THEIR DRUG ADHERENCE  
IN NORTHERN THAILAND**

**NARDLADA KHANTIKUL**

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Thesis  
entitled

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IN NORTHERN THAILAND**

.....  
Miss Nardlada Khantikul  
Candidate

.....  
Assoc. Prof. Piyarat Butraporn,  
D.V.M., Dr.P.H.  
Major Advisor

.....  
Assoc. Prof. Somjai Leemingsawat,  
Dr.Med.Sc.  
Co-Advisor

.....  
Asst. Prof. Han S. Kim,  
Ph.D.  
Co-Advisor

.....  
Prof. MA. Sandra Bernardo Tempongko,  
Dr.P.H.  
Co-Advisor

.....  
Prof. Banchong Mahaisavariya, M.D.  
Dean  
Faculty of graduate Studies

.....  
Assoc. Prof. Songsak Petmitr, Ph.D.  
Chair  
Doctor of Philosophy Programme in  
Tropical Medicine  
Faculty of Tropical Medicine

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entitled

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on  
April 17, 2008

.....  
Miss Nardlada Khantikul  
Candidate

.....  
Miss Wannapa Suwonkerd,  
Ph.D.  
Chair

.....  
Assoc. Prof. Piyarat Butraporn,  
D.V.M., Dr.P.H.  
Member

.....  
Assoc. Prof. Somjai Leemingsawat,  
Dr.Med.Sc.  
Member

.....  
Asst. Prof. Han S. Kim,  
Ph.D.  
Member

.....  
Prof. MA. Sandra Bernardo Tempongko,  
Dr.P.H.  
Member

.....  
Prof. Banchong Mahaisavariya, M.D.  
Dean  
Faculty of Graduate Studies  
Mahidol University

.....  
Assoc.Prof. Pratap Singhasivanon,  
M.B.B.S., D.T.M. & H., Dr.P.H.  
Dean  
Faculty of Tropical Medicine,  
Mahidol University

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Nardlada Khantikul

**VIVAX MALARIA PATIENTS AND THEIR DRUG ADHERENCE IN  
NORTHERN THAILAND****NARDLADA KHANTIKUL 4837562 TMTM/D  
Ph.D. (TROPICAL MEDICINE)****THESIS ADVISORS: PIYARAT BUTRAPORN, Dr.P.H., SOMJAI LEEMINGSAWAT,  
Dr.Med.Sc., HAN S. KIM, Ph.D., MA. SANDRA BERNARDO TEMPONGKO, Dr.P.H.****ABSTRACT**

The main objective of this study was to increase the adherence of patients to anti-vivax malarial medications in the Mae Hong Son Province in northern Thailand. The study conducted a retrospective base-line data collection in phase I and continued to a quasi-experimental design for Information, Education, and Communication (IEC) implementation in phase II. For this study nine malaria clinics in the Muang District and three clinics in the Mae Sa Rieng District were selected. 206 patient histories concerning drug-taking behaviors were examined. In phase II, the IEC implementation was launched in the Muang malaria clinics as the intervention site and clinics in Mae Sa Rieng as the control site. The implementation phase was comprised of programs which aimed to enhance the capability of malaria officers concerning problem solving and increasing self-esteem and self-efficacy. The malaria officers designed and developed friendly, tailored IEC materials and an instruction package for vivax malaria patients who visited and received treatment at the study clinics. In contrast, the control areas received on unchanged routine treatment for anti-vivax medications as usual.

The results from phase I revealed that 49 out of 206 patients (23.8%) completely adhered to the medications and 157 out of 206 patients (76.2%) did not adhere to the medication prescription. Most of those in the non-adherent group stated that they were confused about the prescription from the clinics. Some neglected taking primaquine for 14 days, and some were troubled with side-effect of chloroquine. The determinants that were associated with the patient's adherence were the knowledge concerning malaria (adjusted OR=2.22, 95%CI=1.10-4.45), and the ability to access information related to antimalarial medication (aOR=5.58, 95%CI=2.06-15.14).

The results from phase II revealed that 100 out of 142 patients (71.1%) in the intervention group adhered to their prescriptions. However, only 35 out of 117 (29.9%) of the patients in the control group adhered to the treatment. The mean scores for the intervention group regarding knowledge, perception of malaria treatment, self-efficacy to perform drug adherence, access to information on antimalarial medication, and satisfaction with health services from malaria clinics were significantly higher after implementation than before implementation (p-value <0.05). The mean scores were also significantly higher among the intervention group than that of the control group (p-value<0.05).

The overall results of this study may be beneficial for malaria officers as it could help them be cognizant of socio-cultural factors in developing an innovative intervention program for vivax malaria patients concerning adherence to treatment prescriptions.

**KEY WORDS: VIVAX MALARIA/ DRUG ADHERENCE/ CHLOROQUINE/  
PRIMAQUINE/ IEC PROGRAM/ THAILAND**

ผู้ป่วยมาลาเรียไวกวักซ์กับการกินยารักษาในภาคเหนือของประเทศไทย (VIVAX MALARIA PATIENTS AND THEIR DRUG ADHERENCE IN NORTHERN THAILAND)

นารัตถดา ชันธิกุล 4837562 TMTM/D

ปร.ค. (อายุรศาสตร์เขตร้อน)

คณะกรรมการควบคุมวิทยานิพนธ์: ปิยะรัตน์ บุตรารักษ์, Dr.P.H., สมใจ ลีมิ่งสวัสดิ์, Dr.Med.Sc., Han S. Kim, Ph.D., M.A. Sandra Bernardo Tempongko, Dr.P.H.

### บทคัดย่อ

วัตถุประสงค์การศึกษา เพื่อเพิ่มประสิทธิภาพการกินยารักษาของผู้ป่วยมาลาเรียในจังหวัดแม่ฮ่องสอน การศึกษาแบ่งเป็น 2 ระยะ คือระยะที่หนึ่งเป็นการศึกษาวิจัยโดยการเก็บข้อมูลพื้นฐานย้อนหลัง และระยะที่สองเป็นการวิจัยกึ่งทดลอง โดยการใช้โปรแกรมการให้ความรู้ ข้อมูลและการสื่อสารกับผู้ป่วยมาลาเรียไวกวักซ์ พื้นที่ศึกษาคือ มาลาเรียคลินิก จำนวน 9 แห่ง ในอำเภอเมือง และ 3 แห่งในอำเภอแม่สะเรียง จังหวัดแม่ฮ่องสอน ในระยะแรกเก็บข้อมูล โดยการสัมภาษณ์พฤติกรรมกรรมการกินยารักษาของผู้ป่วยมาลาเรียที่มีประวัติมารับการรักษาที่ มาลาเรียคลินิกตัวอย่าง จำนวน 206 คนใน 2 อำเภอ ส่วนในระยะที่ 2 ดำเนินการทดลองในอำเภอเมือง และอำเภอแม่สะเรียงเป็นกลุ่มควบคุม โดยได้ดำเนินการเพิ่มความสามารถของเจ้าหน้าที่มาลาเรียในเรื่องกระบวนการแก้ปัญหา การพัฒนาความเชื่อมั่นในตนเอง การพัฒนาความสามารถของตนเองต่อการสร้างโปรแกรมการให้ความรู้ ข้อมูลและการสื่อสารในมาลาเรียคลินิก รวมถึงการจัดทำและผลิตสื่อที่เหมาะสมกับผู้ป่วยมาลาเรียไวกวักซ์

ผลการศึกษาระยะที่ 1 พบว่า ผู้ป่วยมาลาเรียไวกวักซ์ จำนวนทั้งสิ้น 206 คน มีเพียง 49 คน (23.8%) กินยาได้ถูกต้อง ครบถ้วน และตรงตามแผนการรักษาที่ได้รับจากมาลาเรียคลินิก ส่วน 157 คน (76.2%) กินยาไม่ถูกต้อง ครบถ้วน ด้วยเหตุผลที่ว่าสับสน ละเลยและลืมเนื่องจากต้องกินยาไปรวมมากถึง 14 วัน บางคนบอกว่าขณะกินยา คลอโรควินมีอาการข้างเคียงเกิดขึ้น อย่างไรก็ตามปัจจัยที่มีผลต่อการกินยาของผู้ป่วยมาลาเรียมีความสัมพันธ์กับความรู้อันเนื่องมาจากมาลาเรียและเรื่องการเข้าถึงข้อมูลของยาที่ใช้รักษามาลาเรียไวกวักซ์ สำหรับผลการศึกษาระยะที่ 2 พบว่า ผู้ป่วยมาลาเรียไวกวักซ์กลุ่มทดลองที่ได้รับโปรแกรมการให้ความรู้ ข้อมูลเกี่ยวกับมาลาเรียรวมถึงยาที่ใช้รักษา และการสื่อสารที่เหมาะสมกับผู้ป่วย จำนวน 100 คน จาก 142 คน (71.1%) กินยาได้ถูกต้อง ครบถ้วน และตรงตามแผนการรักษาที่ได้รับจากมาลาเรียคลินิก ส่วนผู้ป่วยมาลาเรียไวกวักซ์กลุ่มควบคุม จำนวน 35 คน จาก 117 คน กินยาได้ถูกต้อง ครบถ้วนเพียง ร้อยละ 29.9 นอกจากนี้พบว่าภายหลังการทดลองค่าเฉลี่ยคะแนนความรู้ การรับรู้เรื่องมาลาเรียและการรักษา ความเชื่อมั่นในความสามารถของตนเองในการกินยา การเข้าถึงข้อมูลของยาที่ใช้รักษามาลาเรียไวกวักซ์ และความพึงพอใจที่มีต่อการบริการที่มาจากมาลาเรียคลินิกของผู้ป่วยในกลุ่มทดลองสูงกว่า ก่อนการทดลอง และสูงกว่าคะแนนเฉลี่ยของกลุ่มควบคุม ผลการศึกษาเป็นประโยชน์ต่อเจ้าหน้าที่มาลาเรียคลินิก ในการพัฒนาโปรแกรมการให้ความรู้ ข้อมูลและการสื่อสารกับผู้ป่วยมาลาเรียไวกวักซ์เพื่อให้สามารถกินยารักษาได้อย่างถูกต้อง

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## **LIST OF ABBREVIATIONS**

API	Annual Parasite Incidence
ETP	Empowerment Training Program
IEC	Information Education and Communication
MCs	Malaria Clinics
SCT	Social Cognitive Theory
WHO	World Health Organization

# CHAPTER I

## INTRODUCTION

### 1. BACKGROUND AND SIGNIFICANCE OF THE PROBLEM

Malaria is one of the most common parasitic diseases and a major public health problem in many tropical and subtropical countries. Between 700,000 and 2.7 million people died from malaria every year (WHO, 2005). Despite more than 100 years since Laveran described plasmodium species and Ross confirmed that they were transmitted by female anopheline mosquitoes, malaria remains a leading cause of morbidity and mortality worldwide (Guinovart, 2006). *Plasmodium vivax*, *P. falciparum*, *P. malariae*, and *P. ovale* are four *Plasmodium* species that cause malaria in humans. The estimated global burden of malaria due to *P. vivax* is approximately 70 to 80 million cases annually (WHO, 2006).

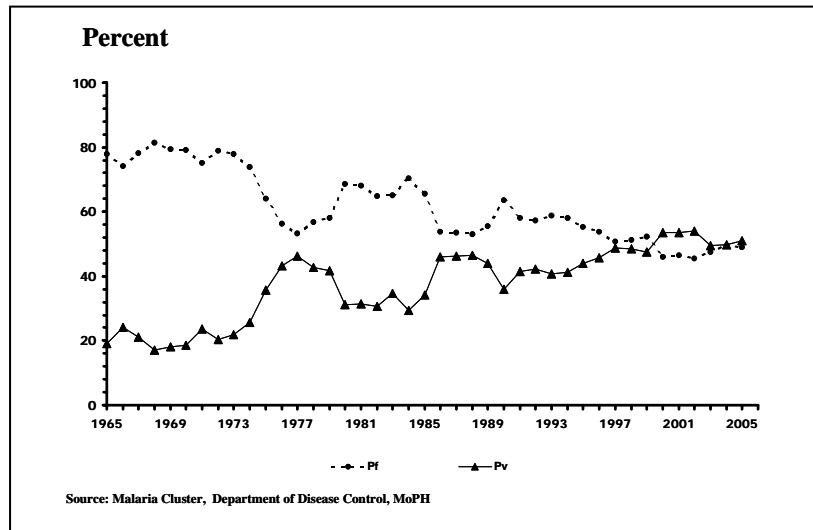
#### **Global Burden Malaria in South East Asia**

*P. vivax* is the predominant malaria parasite in the Asia-Pacific region and South America and accounts for more than half of all malaria cases outside Africa. About 80 to 90% of the world cases of *P. vivax* occur in the Middle East, Asia, and Western Pacific; 10 to 15% in Central and South America; and 10 to 20% in sub-Saharan Africa (Mendis *et al*, 2001; Breman, 2001). While there have been efforts to control *P. falciparum*, *P. Vivax*, which is widespread in Southeast Asia, has been mostly ignored (WHO, 2006). During the past decade, malaria has resurged or increased in intensity in Southeast Asia after interruption of eradication efforts (WHO, 2006), and re-emerged in several Central Asian and Tran Caucasian countries (WHO, 2005). According to the World Health Organization (WHO), rapid diagnosis and prompt treatment is critical for successful malaria control and prevention of drug resistance. This is particularly true for Southeast Asia, where multi-drug resistance is common (WHO, 2005).

The difficulty in controlling *P. vivax* has been exacerbated for several reasons. First, the developmental biology of *P. vivax* is unique in early gametocytogenesis and the generation of *hypnozoites* in the liver that are responsible for relapses of the disease. Second, the response of *P. vivax* to some antimalarials differs when compared with *P. falciparum*. Third, the behavior and physiology of mosquito vectors, especially cryptic species, are largely unknown in many regions where *P. vivax* is endemic. Finally, the lag of *P. vivax* behind *P. falciparum* research and funding has limited our potential to develop effective control measures tailored to *P. vivax* (Sattabongkot *et al.*, 2004).

### **Burden of Vivax Malaria in Thailand**

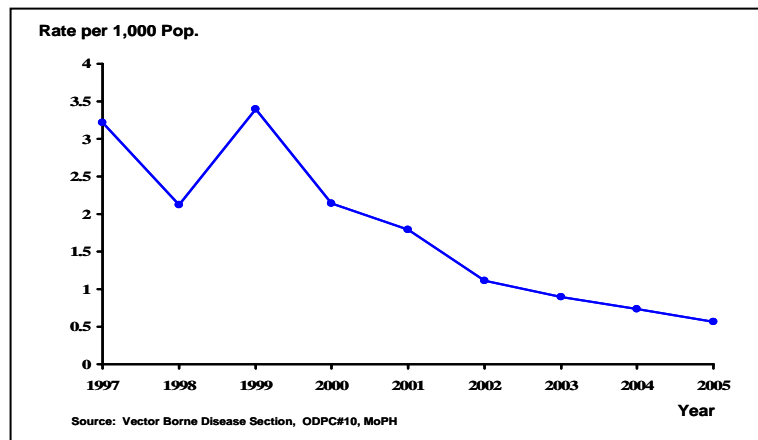
Malaria in Thailand remains a major public health problem. At present, malaria is forest-related and confined along the international borders. Approximately half of the malaria cases in Thailand are the result of *P. vivax* infections alone or mixed infections by *P. vivax* and *P. falciparum*. This increasing trend of *P. vivax* malaria incidence and the emergence of drug-resistant strains of the *P. vivax* parasite are a major concern for future malaria control (WHO, 2006). In 2005, the country's annual parasite incidence rate was 4.5/10,000 populations. There were 50 deaths, resulting in a mortality rate of 0.076 deaths/100,000 persons (Bureau of Vector Borne Disease, 2005). The successful control of *P. vivax* transmission in larger malaria-endemic areas will depend on a precise definition of local epidemiology and consistent government support. Thailand has implemented four steps to control malaria: 1) early diagnosis and prompt treatment; 2) promoting health education to populations at risk; 3) vector control by indoor residual spraying and insecticide treated materials; and 4) monitoring insecticide resistance. These steps have enabled substantial success in reducing malaria transmission in the central part of Thailand (Sattabongkot *et al.*, 2004). In the past, the most common malaria species was *P. falciparum* (more than 50%); however the proportion has shifted from *P. falciparum* dominance to *P. vivax* since 2000 and *P. vivax* has increased from 20% of total malaria cases in 1965 to 50% in 2005 (Figure 1).



**Figure 1** Temporal dynamics of *Plasmodium falciparum* (Pf) and *Plasmodium vivax* (Pv) proportions in Thailand, FY 1965-2005.

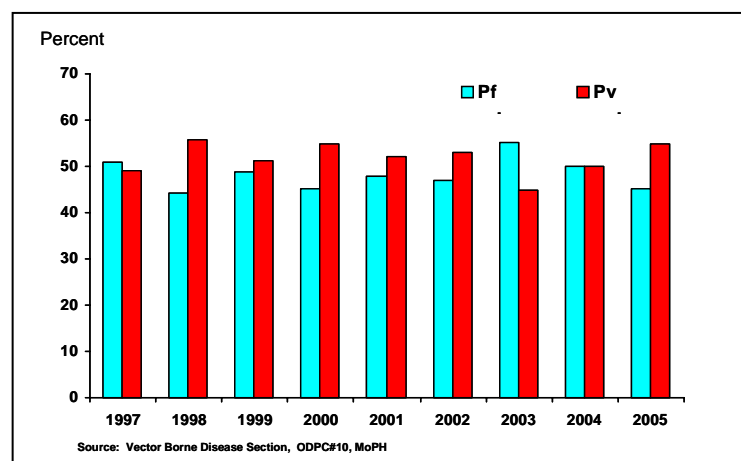
### Burden of Vivax Malaria in Northern Thailand

The control of malaria in northern Thailand is under the responsibility of the Office of Disease Prevention and Control Region 10, Chiangmai, covering 4.74 million populations comprising mixed ethnic Thai and hill tribe minority groups. In 2005, 2,699 microscopically confirmed cases were reported, of which 46% were *P. falciparum* and 54% were *P. vivax*. The annual parasite incidences (API) per 1,000 population of the six provinces in the northern region (Maehongson, Chiangmai, Lampang, Lamphun, Chiangrai and Phayao provinces) were 3.22 in 1997, increased up to 3.40 in 1999 and decreased consecutively to 1.79, 1.11, 0.90, 0.74, 0.57 in 2001-2005, respectively (Figure2). Malaria mortality rates in the six provinces were 0.26, 0.42, 0.13, 0.02, and 0.17 per 100,000 in 2001-2005 respectively.



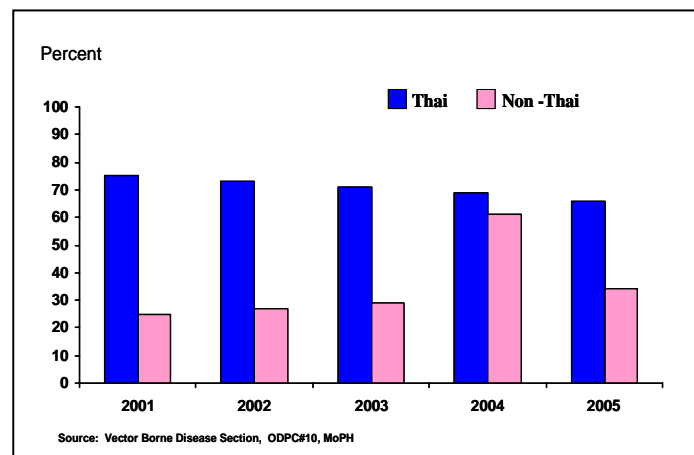
**Figure 2** Annual Parasite Incidence (API) in six provinces, northern Thailand, FY 1997-2005.

Malaria due to *P.vivax* has placed huge burdens on health in northern Thailand. The proportion of *P.vivax* has been higher than *P. falciparum* since 1998 except in 1997 and 2003 (Figure 3). In areas near the Thai–Myanmar border, such as Mae Hong Son, Chiang Mai and Chiang Rai where malaria transmission is high, the proportion of *P. vivax* cases has slightly increased over time. In the other areas, the proportion of *P. vivax* has markedly increased.



**Figure 3** Distribution proportion between *P.falciparum* and *P.vivax* in six provinces, northern Thailand, FY 1997-2005.

In northern Thailand, the nationalities of malaria patients have been identified since 1995, which can be used to divide malaria patients into three groups. The first group is Thais. The second group is non-Thais who have permanent residency in Thailand (F1). And the third group is non-Thais who have temporary residency (F2). The proportions of *P. vivax* cases were between 65.65 and 75.10 in Thai cases and 24.90-34.36 in the non-Thais (F1 and F2) cases between 2001 and 2005 (Figure 4).



**Figure 4** Distribution proportions of *P. vivax* Cases between Thais and Non-Thais in six Provinces, northern Thailand, FY 2001-2005.

Mae Hong Son Province is located on the Thai-Myanmar border in northwestern Thailand. The province is geographically homogenous with 90% of the area covered with mountainous and about 70% with mainly mixed deciduous and dry dipterocarp forests (Suwonkerd *et al.*, 2004). The province is administratively divided into seven districts, 45 cantons, and 395 villages. The population composes of Thai nationals and many hilltribes of various ethnic groups. Malaria history in Mae Hong Son Province has shown that the transmission occurs throughout the year with a major peak during the early part of wet season (May to August) and a smaller one in dry season (November to January), and the general change and the general pattern did not change over the past two decades (Suwonkerd *et al.*, 2004; Childs *et al.*, 2006). The transmission is closely related to forest location where there is abundance of malaria vector breeding sites (Ketrangsee *et al.*, 1991; Somboon *et al.*, 1998). Malaria transmission has the potential to increase significantly due to global warming. Climate

change would directly affect malaria transmission by shifting the vector's geographic range, as well as increasing reproductive and biting rates by shortening the pathogen incubation period (Patzet *et al.*, 1996). Various occupational factors encourage population movement or influx of refugees, which may impact malaria transmission (Butraporn *et al.*, 1986; Fungladda *et al.*, 1987; Sornmani, 1995; Butraporn *et al.*, 1995). The rapid socio-economic changes in Thailand of recent decades have mainly taken place in large population centers and focal areas in the central valley of Mae Hong Son Province (Benthem *et al.*, 2006). The surveillance reports indicated that malaria has become endemic throughout Mae Hong Son province. The incidence rates of malaria in Mae Hong Son Province were 24.4, 14.2, 10.04, 8.52, and 8.32 per 1,000 populations in the years 2001-2005. (Vector Borne Disease Section, ODPC 10, 2005). These incidence rates were higher than that of the national malaria control program, and significant reductions in malaria transmission would be needed to lower the rate to the national goal of 1 per 1,000 populations (Bureau of Vector Borne Disease, 2005).

The increase in *P. vivax* prevalence is even more dramatic in certain geographical areas. One reason for the increasing prevalence of *P. vivax* is that *P. falciparum* is an easier species to control with effective drug treatment because of the lack of *hypnozoite* stages. In addition, efforts to control drug-resistant *P. falciparum* have been very effective, hence altering the competition between *P. falciparum* and *P. vivax* (Povoa *et al.*, 2003; Limrat *et al.*, 2001). However, increasing *P. vivax* prevalence could also be due to changes in vector potential (Childs *et al.*, 2006). The differences in parameters that determine the vectorial capacity of a given *anopheline* species might also be responsible for the temporal changes in the prevalence of *P. vivax*. Mosquito longevity is an important parameter to determine vectorial capacity for a malaria parasite (Warrell, 2002, Suwonkerd *et al.*, 2004). Depending on the environmental and physiological factors, the average longevity of *Anopheles* mosquitoes in tropical countries varies from ten days to more than a month (Warrell, 2002). Thus, if sporogonic development of *P. vivax* is faster than *P. falciparum* in natural vectors compared with laboratory reared colonies of *anopheline* vectors, its transmission might predominate in certain areas where the vectors have a shorter lifespan (Sattabongkot *et al.*, 2004).

Patient adherence and compliance are synonymous (Haynes *et al.*, 2006). Patient adherence has been defined as the extent to which a person's behavior taking medication (Becker *et al.*, 1978), executing lifestyle changes corresponds with agreed recommendations from a healthcare provider (WHO, 2003). Adherence to (or compliance with) a medication regimen is generally defined as the extent to which patients take medications as prescribed by their health care providers (Osterberg & Blaschke, 2005). Numerous factors may influence medication compliance, such as patient's characteristics, disease particularities, drug treatment modalities or physician's attitudes. The consequences of medication non-compliance may not only be dangerous for the patient's health, but also dramatically increase the financial cost for public health services. A critical consequence of medication non-compliance, particularly incomplete drug taking resulting in frequent instances of under dosing, with patients stopping treatment as soon as they feel well rather than completing the full regimen, is the development of resistant parasites. Thus, all energies should be devoted to improve drug compliance, including treatment optimization and simplification, patient's information and education, use of practical means that facilitate adherence to medical recommendation, and the patient being responsible for his/her treatment (Scheen, 1999).

Several factors are known to contribute to adherence (WHO, 2003): the specific condition being treated, the healthcare system and team delivering the intervention, the social and economic conditions of the patients and settings, characteristics of the therapy itself, and contribution of the individual patients. Furthermore, the degree to which a patient adheres to the treatment schedule prescribed is determined by numerous and intervening factors, such as perception of disease, acceptance of the treatment, its cost, the complexity of the schedule, the quality of prescription, or the patient's clinical improvement (Rauyajin, 1988; White & Olliaro, 1996).

It is clear that case investigation and promptly treatment alone is not sufficient for successful malaria control. Effective antimalarial drugs and interventions that aid people in taking the correct treatment are also needed to maximize effectiveness. Changing and improving human behavior to follow a given treatment regimen is difficult and it is even more difficult when the behaviors are unfamiliar. In order to

overcome this problem, encouraging and using information education and communication strategies in participation in drug adherence to enhance patients adhere to anti-malarial therapy among vivax malaria cases will be considered as a sustainable tool for malaria prevention and control. The purpose of this research study is to identify determinants that are associated with drug adherence of vivax malaria patients. With this knowledge, we hope to promote a health education campaign for malaria officers who prescribe drug treatments in clinics in Mae Hong Son Province, northern Thailand.

## **2. RESEARCH QUESTIONS**

2.1 What are crucial factors influencing adherence and non-adherence to drug treatment in vivax malaria patients?

2.2 Could an information, education, and communication (IEC) program be developed after training the malaria workers through a participatory program at malaria clinics?

2.3 Will the developed IEC program significantly increase knowledge, perception and behaviors of malaria among vivax malaria patients and therefore increase drug adherence?

## **3. RESEARCH OBJECTIVES**

### **3.1 General Objective**

To assess the effectiveness of an IEC program in increasing adherence to vivax malaria treatment among patients at malaria clinics in Muang district, Mae Hong Son Province.

### **3.2 Specific Objectives**

3.2.1 To investigate determinants that influence drug adherence and non-adherence among vivax malaria patients who visit malaria clinics.

3.2.2 To design and develop IEC materials and easy-to-follow drug packages for chloroquine and primaquine tablets.

3.2.3 To implement and evaluate the IEC program's effectiveness in increasing drug adherence among vivax malaria patients at malaria clinics.

#### **4. RESEARCH HYPOTHESES**

4.1 After attending the participatory training program and contributing to the development of the IEC program, the malaria officers will improve their self-esteem and self-efficacy behaviors and improve their ability to implement the IEC program to vivax malaria patients.

4.2 After the IEC program, the patients will have increased knowledge, better perception on malaria and malaria treatment, better perception of the benefit and barriers of drug adherence, better self-efficacy in drug taking, and increased satisfaction of health services and the IEC program from malaria clinics. This will lead to behavior changes that will increase adherence to malaria drug treatments.

#### **5. SIGNIFICANCE OF THE STUDY**

This project will eventually be applied to other malaria clinics. The results of this study will help health personnel to be cognizant of socio-cultural factors in developing a health program for vivax malaria patients. Therefore, adherence to malaria treatment in this area will be improved through project implementation. This project will be applied for other local needs, and can be used for further training of field malaria officers in other areas in the country, and can be directed towards developing and testing innovative approach to assist patients to follow treatment prescriptions.

#### **6. STUDY VARIABLES**

**6.1 Independent variables are:** Socio-demographic characteristics, knowledge and perception on malaria; perceived susceptibility, perceived severity of malaria, perceived benefit and barriers of adherence to the anti-vivax malarial medication, satisfaction and understanding toward health services at malaria clinics and social support that is encouraged from family and community members to the patients to cooperate with malaria officers.

**6.2 Dependent variables:** Adherence by vivax malaria patients to treatment: adherence is defined in relation to dosage, frequency of daily administration and duration of treatment. A patient is said to have adhered if they follow the prescriptive instructions exactly. In this study, *P. vivax* patients will be categorized as adherent if

they are able to complete three days of chloroquine 2,500 mg, where 1,500 mg are divided equally into three meals in the first day, 500 mg one meal in the second day, and the other 500 mg in the third day, and primaquine 15 mg per day for fourteen days.

## **7. DEFINITION OF TERMS**

**7.1 Information, Education, and Communication (IEC) for vivax malaria patients in malaria clinics** compose of three components;

7.1.1 IEC structure or necessary fundamental factors for improving adherence to vivax malaria treatment consisting of: 1) structure of malaria clinics, 2) development of responsible malaria officers, 3) necessary media and materials for encouraging vivax malaria patients to complete their drug prescriptions.

7.1.2 IEC process consisting of: 1) the study and analysis of the baseline data, 2) development of IEC plan which will cover the development of health behaviors by selecting the problem, specifying behaviors that need to be developed, setting detailed activities to modify the behaviors such as specific/behavioral objectives for changing target's behaviors with regard to knowledge, perception, and behaviors, specifying target groups, defining effective IEC strategies, evaluating, and assigning the responsible persons for implementing the IEC program.

7.1.3 Outcomes, consisting of: 1) establishment of new drug packaging and drug taking behavior plan; 2) production of IEC materials, training personnel and implementing the plan; 3) supervising and monitoring; 4) evaluation of drug adherence among vivax malaria patients; 5). Patient satisfaction with the health care service; and 5) the malaria officers' satisfaction with their job performance.

**7.2 Empowerment training program** refers to a three day program with an emphasis on participatory learning, comprising of experiential learning, group process, and adult learning. This will help train malaria officers in participation, teamwork skill, planning, and evaluation. The activities will be organized by lecture, group discussion, brainstorming, practice session, etc. with regard to participatory programs developed by the researcher. The goals of the activities are to change behaviors of malaria workers regarding self-esteem, self-efficacy, ability to promote health education of vivax malaria treatment, skills of performing health education plan

accordingly with IEC process, and skills in developing IEC program, all of which will increase the malaria officer's job satisfaction and performance. They will be expected to apply this training so that they can provide effective health education to vivax malaria patients, increase job satisfaction and self esteem, and ultimately increase malaria medication adherence.

**7.3 Self-esteem** refers to the malaria officers' opinions or feeling of ability, significance, prestige, responsibility, self-actualization, expected evaluation, and acceptance from the others.

**7.4 Self-efficacy** refers to the perception of malaria workers regarding his/her ability to accomplish the IEC program to improving adherence to vivax malaria treatment.

**7.5 Knowledge on malaria** refers to the ability of the vivax malaria patients to identify the cause of malaria, mode of transmission, signs and symptoms, complication and practices on malaria prevention and treatment.

**7.6 Perceived malaria and malaria treatment** refers to the Health Belief Model (HBM) constructs;

7.6.1 The perceived susceptibility refers to the degree to which an individual perceives her/himself to be vulnerable to contract the disease.

7.6.2 The perceived severity of malaria refers to the degree to which an individual believes malaria is a serious disease.

7.6.3 The perceived benefit of adherence to the antimalarial medication refers to the degree to which respondents believe their medications are effective in curing the disease.

7.6.4 The perceived barriers of adherence to antimalarial medication refers to the degree to which an individual believes there are barriers associated with adherence to anti-malarial medication, such as getting side effects, forgetting to take the medicine, and living far away from the malaria clinic.

7.6.5 Self-efficacy is defined as the conviction that one can successfully execute the behaviors required to produce the outcome. Self-efficacy has been measured in terms of patients feeling themselves to be competent (self-efficacious) to overcome perceived barriers to take action.

7.6.6 Cues to action refer to an individual's perception of the levels of susceptibility and seriousness that provide the force to act. Cues to action have been measured in terms of receiving information from malaria officers, reading information about anti-malarial medication, and observing others who have experienced malaria.

**7.7 Access to information on antimalarial medications** refer to remember the course of antimalarial prescriptions, recall the type of medicine taking, understand drug labels and instructions, know how to solve the side effect of drug, receive correct packaging of medication, and attend the required follow-up appointment to determine parasite clearance.

**7.8 Adherence** refers to the relation to dosage, frequency of daily administration and duration of treatment. A patient is said to have adhered if they follow the medication instructions exactly. In this study, for example, *P. vivax* patients have been categorized as adherent if they take 2,500 mg of chloroquine within three days and primaquine 15 mg per day for fourteen days.

**7.9 Job satisfaction of malaria workers** refers to the opinion malaria officers have toward the outcome of their job performance; professional work involves program planning, opportunity for developing IEC skills and career development; autonomy refers to potentially modifying the IEC program so that it is suitable for a patient's needs, as well as the ability to work freely; professional relationships refer to good relationships that are supporting, accepting, use teamwork and coordination with colleagues; Role enactment refers having sufficient time to administer the IEC program, and to be able to participate throughout the research project.

**7.10 Satisfaction of vivax malaria patients** refers to the emotion and feeling towards the quality services provided from malaria clinics; convenience refers to travel to get the service, wait time for services and the convenience of the facilities; information refers to providing information regarding causes of illness, treatment, self-care medication from malaria workers; coordinating refers to follow up appointment time; quality of health services includes the adequacy of malaria officers, equipment, and medias/materials.

## **CHAPTER II**

### **LITERATURE REVIEW**

This chapter presents a review of the theoretical and practical literature describing the concepts in the study. The relative concepts and theories will be applied as a guideline to conduct the activities as follows:

- 2.1 Knowledge of *Plasmodium vivax*
- 2.2 The Health Belief Model
- 2.3 The Social Cognitive Theory
- 2.4 Information Education and Communication Strategies
- 2.5 Relevant Research

#### **2.1 KNOWLEDGE OF *PLASMODIUM VIVAX***

Malaria is an acute and chronic disease caused by intracellular protozoa of the genus *Plasmodium*. *Plasmodium vivax*, *P. falciparum*, *P. malariae*, and *P. ovale* are the four *Plasmodium* species that cause malaria in humans. The parasite *P. vivax* is the most frequent and widely distributed cause of benign, but recurring (tertian), malaria. It is one of four species of parasite that commonly cause malaria infection in humans. It is less virulent than *Plasmodium falciparum*, the deadliest of the four, and seldom fatal. *P. vivax* is passed on by the female *Anopheles* mosquito, since it is the only gender that bites. The estimated global burden of malaria due to *P. vivax* is approximately 70 to 80 million cases annually. *P. vivax* is the predominant malaria parasite in the Asia-Pacific region and South America and accounts for more than half of all malaria cases outside Africa. About 80 to 90% of the world's cases of *P. vivax* occur in the Middle East, Asia, and Western Pacific; 10 to 15% in Central and South America; and 10 to 20% in sub-Saharan Africa (Mendis *et al.*, 2001).

*Plasmodium vivax* and *P. falciparum*, the two most prevalent species of malaria that infect humans, often co-exist in many parts of the world. In Thailand and many other malaria-endemic countries, *P. falciparum* and *P. vivax* are often

transmitted by the same vector species. Thus, the two parasite species are subject to similar control programs, which include collection of baseline information and implementation of various control measures.

Vivax malaria usually causes benign uncomplicated malaria with relapses, and its clinical features differ from those of falciparum malaria (Table 1). However, infections occasionally result in severe clinical symptoms similar to *Plasmodium falciparum* (Beg *et al.*, 2002).

**Table 1** Clinical features of *Plasmodium falciparum* and *Plasmodium vivax* (Warrell, 2002)

	<i>P. falciparum</i>	<i>P. vivax</i>
Prepatent period (days)	5.5	≥ 8
Incubation period (days)	9–14 (12) <sup>a</sup>	12–17 (15) <sup>a</sup> or up to 6–12 months
Fever periodicity (hours)	24, 36, 38	48
Erythrocytes parasitized	All	Reticulocytes
Merozoites per schizont	8–32	12–24
Relapses	No	Yes
Recrudescences	Yes	No
Drug resistance	Yes (to multiple drugs)	Yes (to chloroquine)

<sup>a</sup> Mean incubation period is indicated in parentheses for *P. falciparum* and *P. vivax*.

Malaria due to *P. vivax* is an acute illness with a recurring fever every 48 hours. Because malaria transmission rates are low in most areas where *P. vivax* is prevalent, people who become infected develop little immunity. This means people of all ages are susceptible to infection. In endemic populations, repeated attacks of *P. vivax* through childhood and adult life can result in chronic anemia. This rarely results in death but can have a major deleterious effect on personal well being, growth, and on the economic performance at the individual, family, community, and national level (Mendis *et al.*, 2001).

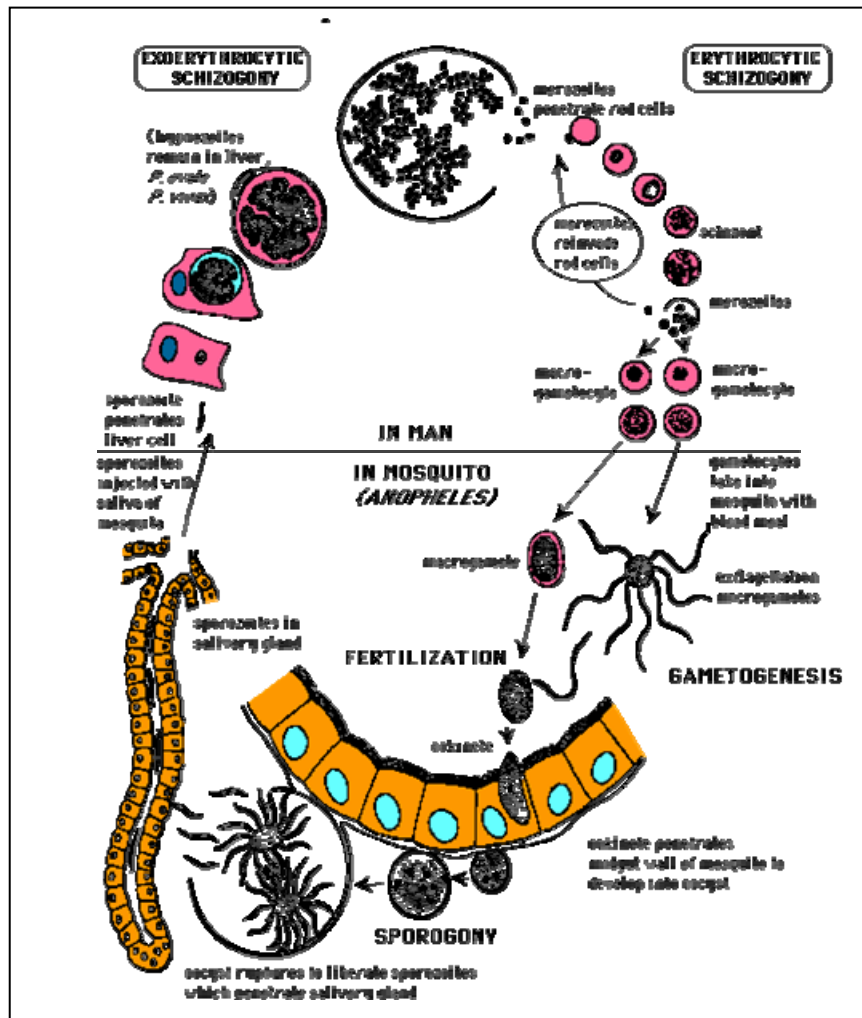


Figure 5 The life-cycle of *Plasmodium vivax* in man & in mosquito.  
(after Vickerman and Cox, 1967)

All malaria parasites require the presence of two hosts to complete their life cycle; the definitive host is the anopheline mosquito and the mammal is the intermediate host. The haploid parasite adopts three very different cellular strategies in the distinct phases of the complex life cycle. The first strategy is the ability to replicate extensively (Schizogony). This is achieved by the three vegetative stages: the oocyst in the mosquito (the process is called sporogony); tissue schizogony (also called exoerythrocytic schizony or pre-erythrocytic schizogony) in the liver of mammalian hosts or in the reticuloendothelial cells in avian/saurian hosts; and erythrocytic schizogony. The second strategy is parasite dispersal and invasion of the host cells.

The parasite stages that adopt this strategy are extracellular and are called merozoites, sporozoites and ookinete. The third strategy is sex, which begins with the formation of the gametocytes in the peripheral circulation of the vertebrate host and is completed upon the formation of the ookinete in the mosquito blood meal.

Infected female anopheline mosquitoes may infect the human host (in the course of acquiring the blood meal needed for ovulation), if sporogony is completed and sporozoites are present in their saliva. The infectious sporozoites can be recovered from the blood for 30-60 minute following intravenous inoculation, and can be found invading liver parenchyma cells (hepatocytes) as quickly as 2 minutes after inoculation. Many sporozoites are ingested by phagocytes, notably Kupffer cells, but may not be destroyed there. In hepatocytes, the host cell forms a parasitophorous vacuole that separates the parasites from the cytoplasm of the host cell. Thereafter, development follows one or two routes. Either there is immediate initiation of a vegetative growth leading to primary schizogony, or the rounded cell enters an arrested phase of development termed the hypnozoite, which remains dormant for many days/weeks until an unknown stimulus promotes re-entry into the cell cycle, and schizogony ensues. This delayed primary blood infection is termed a relapse. Relapses are found in *P.vivax* and *P.ovale*.

Around two weeks after the mosquito bite the tissue schizonts burst from hepatocytes and release several thousands of merozoites into the blood stream, thus the pre-erythrocytic cycle is completed. Merozoites are then released into the surrounding liver tissues to reach the blood stream and some enter the erythrocytes. The merozoites transform to trophozoites by using small amounts of erythrocytic cytoplasm (mainly haemoglobin). Malaria pigment, a breakdown product of haemoglobin, appears in the cytoplasm. Trophozoites undergo a period of active growth leading to multi-nucleated schizonts. After maturation, the schizont divides asexually producing numerous uninucleated merozoites, which burst the erythrocytes, released into the blood stream, and produce an attack of fever in the host. The released merozoites are capable of infecting fresh erythrocytes and this process of schizogony is repeated in successive cycles until the disease is suppressed by drug treatment or host immunity or runs out of target cells (such as in *vivax*) and kills the host. Some of the

merozoites, which enter erythrocytes, undergo sexual differentiation to become haploid male and female gametocytes. Mature male (microgametocytes) and female (macrogametocytes) gametocytes are the forms that are infective to the vector (mosquito).

In the stomach of the mosquito, the microgametocytes form a small number of microgametes through a process of exflagellation. Microgametes fertilize with macrogametes and the two nuclei fuse to give diploid zygotes. The zygotes elongate to form ookinetes, which penetrate the main tissue of the stomach wall to just beneath the outermost membrane of the stomach; ookinetes then encyst and grow rapidly to form oocysts. Repeated nuclear divisions occur within the oocysts and give rise to sporozoites. The oocyst wall ruptures and sporozoites are released. Sporozoites then migrate to the salivary gland where they can initiate the new cycle of development (Gilles and Warrell, 1993).

### **Malaria transmission**

The malaria parasite is transmitted to human by the biting of female *Anopheles* mosquitoes. The three principal environmental factors governing malaria transmission are temperature, humidity and rainfall. Environmental temperature regulates the speed of mosquito breeding. The optimal temperature is between 18 and 30 degrees Celsius. Relative humidity directly affects the length of life and activity of the vector. Low humidity shortens life. Rainfall influences malaria transmission in many ways. It may create breeding places for mosquitoes by producing surface-water collections. The evaporation of large surface-water sheets is apt to keep the relative humidity high, thus prolonging the life span of the vector.

### **The life cycle of *Anopheles* mosquitoes**

Malaria is transmitted between people by the female *Anopheles* mosquitoes, and more than 60 species have been incriminated in the transmission of infection (there are about 430 species of *Anopheles* and about 3500 species of mosquito's altogether). Both male and female mosquitoes feed on nectar and damaged fruits. But only females feed on animal blood to provide proteins for their eggs.

The adult mosquito lives between one week and one month. Females lay their eggs in batches of 70-100 on the surface of water at night. The type of water used for egg laying is indicative of the mosquito species and includes irrigation channels, a pool of water in a tree trunk, and sewage effluent. In tropical temperatures the eggs hatch after two to three days.

The larvae lie just below the surface of the water and feed on algae, and after 7-14 days turn into pupae during a five-minute process. The pupa is comma-shaped and is the least active stage of the *Anopheles* lifecycle. After two to four days the pupa metamorphoses into an adult mosquito. The adults emerge during late evening and are able to fly within minutes.

Mosquitoes usually mate during flight. The male is attracted to the female by the tone of her wing beat, and has antennae that act as sound receptors. Once mated, the female searches out a blood meal, following sensory cues such as host odor, carbon dioxide and convection currents. After feeding, she then seeks out a resting place, which may be indoors or outdoors depending on the species. When the blood meal has been digested, the ovaries develop and the mature eggs are laid at night.

The major factors which determine the efficiency of a mosquito species as a vector are: exophily/endophily (preference for resting outdoors or indoors); exophagy/endophagy (preference for feeding outdoors or indoors); anthropophily/zoophily (preference for feeding on humans or other animals); flight range; types of breeding site; and insecticide susceptibility (Meek, 1995). In Thailand the primary malaria vectors are *Anopheles dirus*, *Anopheles minimus*, and *Anopheles maculatus*, and the secondary vectors are *Anopheles sunaicus*, *Anopheles aconitus*, and *Anopheles pseudowillmori*. Suspected malaria vectors are *Anopheles barbirostris*, *Anopheles philippinensis*, *Anopheles camprestris*, and *Anopheles culicifacies*.

### **The primary vectors**

1. *Anopheles dirus* is the most efficient malaria vector in Thailand. Its resting location is outdoors, the feeding time is mainly late at night from 22.00-02.00 hours and the feeding location is both indoors and outdoors. This species prefers to feed on man. Flight range is 1-5 km. The breeding sites are small shady pools mainly in forest

and plantations, footprints, stream seepage, wheel ruts, gem pits, and hollow logs (Meek, 1995).

2. *Anopheles minimus* is found in foothill areas throughout Thailand. Its mainly resting location is outdoors. Feeding time is all night and location for feeding is mainly outdoors. It prefers man and cow as hosts. Flight range is 2 km. The breeding sites of this species are slow-running streams in the forested and cleared foothills (Meek, 1995).

3. *Anopheles maculatus* is found in forested areas throughout Thailand. Its resting location is outdoors. Peak of feeding times are usually 19.00/20.00 or 21.00-24.00 hours. It prefers to feed outdoors (Meek, 1995). The breeding sites are usually the same as *Anopheles minimus*. It is the predominant vector in the southern of Thailand. It prefers non-humans hosts.

### **The secondary vectors**

1. *Anopheles sundaicus* rests both outdoors and indoors. Feeding time is mainly all night and peaks between 20.00-24.00 hours. It feeds both outdoors and indoor as well. It prefers to feed on man and domestic animal. This species prefer to brackish or salt water near coast, rock pools, and river mouths as breeding sites.

2. *Anopheles aconitus* is found in forested areas and plain areas such as rice field. The breeding sites of this species are streams and rice field. It prefers to feed on animals and feed outdoors.

3. *Anopheles pseudowillmori* is a member of maculatus group. It is known as a predominant malaria vector in Mae Sot District of Tak Province, for *P. falciparum* and *P. vivax*.

### **Malaria diagnosis**

For a definitive diagnosis, the techniques related to malaria diagnosis are composed of clinical diagnosis, microscopic diagnosis, antigen detection, molecular diagnosis and serology (see [http://www.cdc.gov/Malaria/diagnosis\\_treatment/diagnosis.htm](http://www.cdc.gov/Malaria/diagnosis_treatment/diagnosis.htm)).

#### **1. Clinical Diagnosis**

Clinical diagnosis is based on the patient's symptoms and on physical findings at examination. The first symptoms of malaria (most often fever, chills, sweats, headaches, muscle pains, nausea and vomiting) are often not specific and are

also found in other diseases (such as the "flu" and common viral infections). Thus, in most cases the early clinical findings in malaria are nonspecific and need to be confirmed by a laboratory test.

## **2. Microscopic Diagnosis**

Malaria parasites can be identified by examining under the microscope a drop of the patient's blood, spread out as a "blood smear" on a microscope slide. Prior to examination, the specimen is stained (most often with the Giemsa stain) to give to the parasites a distinctive appearance. This technique remains the gold standard for laboratory confirmation of malaria.

## **3. Antigen Detection**

Various test kits are available to detect antigens derived from malaria parasites. Such immunologic ("immunochromatographic") tests most often use a dipstick or cassette format, and provide results in 2-10 minutes. These "Rapid Diagnostic Tests" (RDTs) offer a useful alternative to microscopy in situations where reliable microscopic diagnosis is not available. Malaria RDTs are currently used in some clinical settings and programs. However, before malaria RDTs can be widely adopted, several issues remain to be addressed, including improving their accuracy; lowering their cost; and ensuring their adequate performance under adverse field conditions.

## **4. Molecular Diagnosis**

Parasite nucleic acids are detected using polymerase chain reaction (PCR). This technique is more accurate than microscopy. However, it is expensive, and requires a specialized laboratory (even though technical advances will likely result in field-operated PCR machines).

## **5. Serology**

Serology detects antibodies against malaria parasites, using either indirect immunofluorescence (IFA) or enzyme-linked immunosorbent assay (ELISA). Serology does not detect current infection but rather measures past experience.

The national malaria control program in Thailand has implemented a method for vivax malaria detection by using microscopic examination that can be performed from thick or thin film. Thick film is used routinely in malaria clinics. It is more

reliable to search for parasites in thick blood film than in thin blood film as more quantity of blood is examined. The quality of stain is also important for the sensitivity of parasite detection and identification. Parasite density can be defined by counting asexual parasites (rings, trophozoites and schizonts) against 200 white blood cells in thick film and reported as parasites per 200 white blood cells. Parasitemia can be calculated by the multiplication of parasite count with white blood cell (per  $\mu\text{l}$ ) then divided by 200 (number of white blood cells).

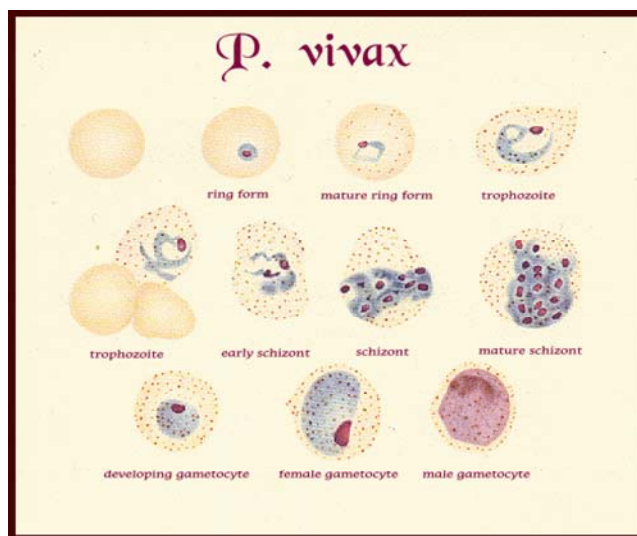


Figure 6 Illustrations show the characteristics of the vivax species in Giemsa stain

#### **Treatment of vivax malaria** (Bruce-Chwatt *et al.*, 1987; Karbwang, 1992)

*Plasmodium vivax* malaria is usually more common than *P. falciparum* malaria and rarely causes any complications. Also, almost all cases of *P. vivax* malaria respond to chloroquine and resistance to this drug has been reported only in sporadic cases in Irian Jaya, Myanmar, Papua New Guinea and Vanuatu. Therefore, *P. vivax* malaria should be treated with chloroquine and primaquine only.

1) **Chloroquine** is the prototype anti malarial drug, used to treat all types of malarial infections. It is also the cheapest, most time-tested and safest anti malarial agent.

**Mechanism of action:** The mechanism of action of chloroquine is unclear. Being alkaline, the drug reaches high concentration within the food vacuoles of the parasite and raises its pH. It is found to induce rapid clumping of the pigment. Chloroquine inhibits the parasitic enzyme heme polymerase that converts the toxic

heme into non-toxic hemazoin, thereby resulting in the accumulation of toxic heme within the parasite. It may also interfere with the biosynthesis of nucleic acids. Other mechanisms suggested include formation of drug-heme complex, intercalation of the drug with the parasitic DNA etc.

**Absorption, fate and excretion:** 90% of the drug is absorbed from the G.I. tract and rapidly absorbed from intra muscular and subcutaneous sites. It has a large distribution volume due to extensive sequestration in tissues of liver, spleen, kidney, lung etc., hence the need for a larger loading dose. Therapeutic blood levels persist for 6-10 days and elimination half-life is 1-2 months. Half of the drug is excreted unchanged by the kidneys, and the remaining is converted to active metabolites in the liver.

**Anti malarial activity:** It is highly effective against erythrocytic forms of *P. vivax*, *P. ovale* and *P. malariae*, sensitive strains of *P. falciparum* and gametocytes of *P. vivax*. It rapidly controls acute attack of malaria with most patients becoming afebrile within 24-48 hours. It is more effective and safer than quinine for sensitive cases.

**Adverse effects:** Chloroquine is a very safe anti malarial. At therapeutic doses, it can cause dizziness, headache, diplopia, disturbed visual accommodation, dysphagia, nausea, malaise, and pruritus of palms, soles and scalp. It can also cause visual hallucinations, confusion, and occasionally frank psychosis. These side effects do not warrant stoppage of treatment. It can exacerbate epilepsy. When used as prophylactic at 300 mg of the base/ week, it can cause retinal toxicity after 3-6 years (i.e. after 50-100 g of chloroquine). Intra muscular injections of chloroquine can cause hypotension and cardiac arrest, particularly in children.

**Contra indications:** Chloroquine should be used with caution in patients with hepatic disease, (even though it is not hepatotoxic per se, it is distributed widely in the liver and is converted to active metabolites there, hence the caution), severe gastro intestinal, neurological or blood disorders. The drug should be discontinued in the event of such problems during therapy. It should not be co-administered with gold salts and phenyl butazone, because all the three can cause dermatitis. Chloroquine may interfere with the antibody response to human diploid cell rabies vaccine.

**Availability:** Chloroquine is available as Chloroquine phosphate tablets; each 250-mg tablet contains 150 mg of the base. Chloroquine hydrochloride injection contains 40 mg of the base per ml.

**2) Primaquine** is the essential co-drug with chloroquine in treating all cases of malaria. It is highly effective against the gametocytes of all plasmodia and thereby prevents spread of the disease to the mosquito from the patient. It is also effective against the dormant tissue forms of *P. vivax* and *P. ovale* malaria, and thereby offers radical cure and prevents relapses. It has insignificant activity against the asexual blood forms of the parasite and therefore it is always used in conjunction with a blood schizonticide and never as a single agent.

**Mechanism of action:** The mechanism of action is not well understood. It may be acting by generating reactive oxygen species or by interfering with the electron transport in the parasite.

**Absorption, fate and excretion:** It is well absorbed after oral administration and rapidly metabolised. Its elimination half-life is about 6 hours. The metabolites of primaquine have oxidative properties and can cause hemolysis in susceptible patients.

**Adverse effects:** In therapeutic doses, primaquine is well tolerated. At larger doses, it may cause occasional epigastric distress and abdominal cramps. This can be minimized by taking the drug with a meal. Mild anemia, cyanosis and methemoglobinemia may also occur. Patients with deficiency of Glucose 6-phosphate dehydrogenase will develop hemolytic anemia on taking usual doses of primaquine. This problem is restricted to certain segments of the population. The drug should be stopped when signs of hemolysis and anemia are observed. It may not be practical to test each patient for G6PD deficiency before administering primaquine. Primaquine should not be used in patients who have severe systemic illness that is likely to cause leukopenia (severe rheumatoid arthritis, SLE etc.). It should not be used with other drugs likely to cause bone marrow depression.

A combination of chloroquine and primaquine is used to treat *P. vivax* malaria. The chloroquine acts on the blood stages of the parasite and the primaquine eliminates the liver forms. Treatment failure in recurrent *P. vivax* malaria may be due either to a failure of the chloroquine or of the primaquine. Primaquine treatment failure or relapse

is defined as the presence of *P.vivax* parasites more than 30 days after the full course of primaquine in a non-endemic area (Looareesuwan *et al.*, 1997). Chloroquine treatment failure is defined as the presence of *P. vivax* parasitaemia during the 30 day follow-up period after the full course of chloroquine in a non-endemic area (Looareesuwan *et al.*, 1997).

According to the present policy of the Thai national malaria control program, vivax malaria cases will receive radical treatment following National Drug Guideline (Table 2) after microscopic confirmation. *P. vivax* cases are treated with chloroquine 2,500 mg within 3 days and primaquine 15 mg daily for 14 days. Malaria cases treated at malaria clinics are uncomplicated malaria cases. Severe malaria cases are referred to nearby district or provincial hospital. Personal protection using mosquito repellents and impregnated bed nets is strongly recommended. *P.vivax* relapses within 3 months after radical treatment must follow the drug prescription as shown in Table 3. If chemoprophylaxis is unavoidable, daily doxycycline (100 mg.) is recommended. However, it should not be continuously used longer than 3-4 weeks. Standby drugs for special groups such as military staff, laborers crossing border, etc., is to be considered by the Director of the Bureau of Vector Borne Disease and the directors of Office of Disease Prevention and Control No. 1-12. The standby drug of choice is Artemisinin derivatives 700 mg. over five days for adults and children over 4 years old. Younger children and pregnant women are prescribed quinine for 7 days (Bureau of Vector Borne Disease, 2005).

**Table 2** First line drug for treatment of *P. vivax*

Age (years)	1 <sup>st</sup> Day				2 <sup>nd</sup> Day		3 <sup>rd</sup> Day		4-14 <sup>th</sup> Day
	1 <sup>st</sup> meal	2 <sup>nd</sup> meal	3 <sup>rd</sup> meal		1 time		1 time		1 time
	C (tab)	C (tab)	C (tab)	P (mg)	C (tab)	P (mg)	C (tab)	P (mg)	P (mg)
14+	2	2	2	15	2	15	2	15	15
8-13	2	2	-	10	1	10	1	10	10
3-7	1	1	1	5	1	5	1	5	5
1-2	1	1	-	2.5	1	2.5	1	2.5	2.5
6 m -1	1	-	-	-	1/2	-	1/2	-	-
< 6 m	1/2	-	-	-	1/2	-	1/2	-	-
Pregnant women	2	2	2	-	2	-	2	-	-

Remark: C is chloroquine 250 mg per tablet; P is primaquine 5 mg, and 15 mg per tablet.

**Table 3** Treatment for *P.vivax* in case of relapses within 3 months after radical treatment.

Age (years)	1 <sup>st</sup> Day				2 <sup>nd</sup> Day		3 <sup>rd</sup> Day		4-14 <sup>th</sup> Day
	1 <sup>st</sup> meal	2 <sup>nd</sup> meal	3 <sup>rd</sup> meal		1 time		1 time		1 time
	C (tab)	C (tab)	C (tab)	P (mg)	C (tab)	P (mg)	C (tab)	P (mg)	P (mg)
14+	2	2	2	20	2	20	2	20	20
8-13	2	2	-	15	1	15	1	15	15
3-7	1	1	1	10	1	10	1	10	10
1-2	1	1	-	5	1	5	1	5	5
6 m -1	1	-	-	-	1/2	-	1/2	-	-
< 6m	1/2	-	-	-	1/2	-	1/2	-	-
Pregnant women	2	2	2	-	2	-	2	-	-

Remark: C is chloroquine 250 mg per tablet; P is primaquine 5 mg, and 15 mg per tablet.

The difficulty in controlling *P.vivax* has been exacerbated for several reasons. First, the developmental biology of *P.vivax* is unique in early gametocytogenesis and the generation of *hypnozoites* in the liver that are responsible for relapses of the disease. Second, the response of *P.vivax* to some antimalarials differs when compared with *P.falciparum*. Third, the behavior and physiology of mosquito vectors, especially cryptic species, are largely unknown in many regions where *P.vivax* is endemic. Finally, the lag of *P.vivax* behind *P.falciparum* research and funding has limited our potential to develop effective control measures tailored to *P.vivax* (Sattabongkot *et al.*, 2004).

As a rule, every malaria case detected by the control program must be followed up. For *P.falciparum* malaria cases, the schedule is on Day 7 and Day 28 after radical treatment. For *P.vivax* and other species malaria cases, the follow-up schedule is on Days 14, 28, 60 and 90 after radical treatment.

## 2.2 THE HEALTH BELIEF MODEL

The Health Belief Model (HBM) is a psychological model that attempts to explain and predict health behaviors by focusing on the attitudes and beliefs of individuals. The HBM was developed in the 1950s as part of an effort by social psychologists in the United States Public Health Service to explain the lack of public participation in health screening and prevention programs. Since then, the HBM has been adapted to explore a variety of long- and short-term health behaviors. The key variables of the HBM are as follows (Rosenstock *et al.*, 1988):

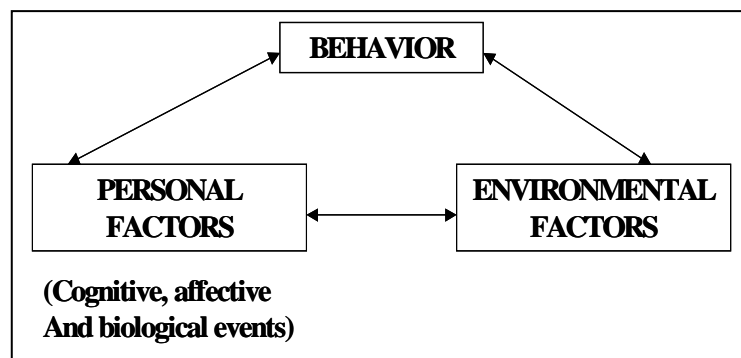
- **Perceived Threat:** Consists of two parts: perceived susceptibility and perceived severity of a health condition.
- **Perceived Susceptibility:** One's subjective perception of the risk of contracting a health condition,
- **Perceived Severity:** Feelings concerning the seriousness of contracting an illness or of leaving it untreated (including evaluations of both medical and clinical consequences and possible social consequences).
- **Perceived Benefits:** The believed effectiveness of strategies designed to reduce the threat of illness.
- **Perceived Barriers:** The potential negative consequences that may result from taking particular health actions, including physical, psychological, and financial demands.
- **Cues to Action:** Events, either bodily (e.g., physical symptoms of a health condition) or environmental (e.g., media publicity) that motivate people to take action. Cues to actions are an aspect of the HBM that has not been systematically studied.
- **Other Variables:** Diverse demographic, socio-psychological, and structural variables that affect an individual's perceptions and thus indirectly influence health-related behavior.
- **Self-Efficacy:** The belief in being able to successfully execute the behavior required to produce the desired outcomes. (This concept was introduced by Bandura in 1997).

**Table 4** Theory at a Glance: A Guide for Health Promotion Practice.

<b>Concept</b>	<b>Definition</b>	<b>Application</b>
<b>Perceived Susceptibility</b>	One's opinion of chances of getting a condition	Define population(s) at risk, risk levels; personalize risk based on a person's features or behavior; heighten perceived susceptibility if too low.
<b>Perceived Severity</b>	One's opinion of how serious a condition and its consequences	Specify consequences of the risk and the condition
<b>Perceived Benefits</b>	One's belief in the efficacy of the advised action to reduce risk or seriousness of impact	Define action to take; how, where, when; clarify the positive effects to be expected.
<b>Perceived Barriers</b>	One's opinion of the tangible and psychological costs of the advised action	Identify and reduce barriers through reassurance, incentives, assistance.
<b>Cues to Action</b>	Strategies to activate "readiness"	Provide how to information, promote awareness, reminders.
<b>Self-Efficacy</b>	Confidence in one's ability to take action	Provide training, guidance in performing action.

## 2.3 THE SOCIAL COGNITIVE THEORY

Social cognitive theory provides a framework for understanding, predicting, and changing human behavior. The theory identifies human behavior as an interaction of personal factors, behavior, and the environment (Bandura, 1986). In the model, the interaction between the person and behavior involves the influences of a person's thoughts and actions. The interaction between the person and the environment involves human beliefs and cognitive competencies that are developed and modified by social influences and structures within the environment. The third interaction, between the environment and behavior, involves a person's behavior determining the aspects of their environment and in turn that environment modifies their behavior (Figure 7).



**Figure 7** Conceptual model of the social cognitive theory

The Social Cognitive Theory (SCT) is relevant for designing health education and health behavior programs which provides a framework for understanding, predicting, and changing human behavior. This theory explains how people acquire and maintain certain behavioral patterns. The theory can also be used for providing the basis for intervention strategies. The social cognitive theory explains how people acquire and maintain certain behavioral patterns, while also providing the basis for intervention strategies (Bandura, 1997). Evaluating behavioral change depends on the factors environment, people and behavior. SCT provides a framework for designing, implementing and evaluating programs. Environment refers to the factors that can affect a person's behavior. There are social and physical environments. Social environment include family members, friends and colleagues. Physical environment is

the size of a room, the ambient temperature or the availability of certain foods. Environment and situation provide the framework for understanding behavior (Parraga, 1990). The situation refers to the cognitive or mental representations of the environment that may affect a person's behavior. The situation is a person's perception of the place, time, physical features and activity (Glanz *et al*, 2002). Environment, people and behavior are constantly influencing each other. Behavior is not simply the result of the environment and the person, just as the environment is not simply the result of the person and behavior (Glanz *et al*, 2002). The environment provides models for behavior. Observational learning occurs when a person watches the actions of another person and the reinforcements that the person receives (Bandura, 1997). The concept of behavior can be viewed in many ways. Behavioral capability means that if a person is to perform a behavior he must know what the behavior is and have the skills to perform it.

Self-efficacy beliefs: of all thoughts that affect human functioning, and standing at the every core of social cognitive theory, are self-efficacy beliefs, "people judgment of their capabilities to organize and execute course of action required to attain designed types of performances". Self-efficacy beliefs provide the founding for human motivation, well-being, and personal accomplishment. This is because unless people believe that their actions can produce the outcomes they desire, they have little incentive to act or to persevere in the face of difficulties. Much empirical evidence now supports Bandura's (2001) contention that self-efficacy beliefs touch virtually every aspect of people's lives whether they think productively, self-debilitating, pessimistically or optimistically; how well they motivate themselves and persevere in the face of adversities; their vulnerability to stress and depression, and the life choices they make. Self-efficacy is also a critical determinant of self-regulation. Of course, human functioning is influenced by many factors. The success or failure that people experience as they engage the myriad tasks that comprise their life naturally influence the many decisions they must make. Also, the knowledge and skills they possess will certainly play critical roles in what they choose to do and not do. Individuals interpret the results of their attainments, however, just as they make judgments about the quality of the knowledge and skills they possess.

## **2.4 INFORMATION EDUCATION AND COMMUNICATION STRATEGIES**

Information, education and communication (IEC) combines strategies, approaches and methods that enable individuals, families, groups, organizations and communities to play active roles in achieving, protecting and sustaining their own health. Embodied in IEC is the process of learning that empowers people to make decisions, modify behaviors and change social conditions. Activities are developed based upon needs assessments, sound educational principles, and periodic evaluation using a clear set of goals and objectives. IEC activities not only need to have an appropriate context in which they are shaped, but it is crucial that health services providers be prepared to respond to any demand that may be created as a result of effective IEC activities. The influence of underlying social, cultural, economic and environmental conditions on health are also taken into consideration in the IEC processes. Identifying and promoting specific behaviors that are desirable are usually the objectives of IEC efforts. Behaviors are usually affected by many factors including the most urgent needs of the target population and the risks people perceive in continuing their current behaviors or in changing to different behaviors. Health information can be communicated through many channels to increase awareness and assess the knowledge of different populations about various issues, products and behaviors. Channels might include interpersonal communication (such as individual discussions, counseling sessions or group discussions and community meetings and events) or mass media communication (such as radio, television and other forms of one-way communication, such as brochures, leaflets and posters, visual and audio visual presentations and some forms of electronic communication). Accordingly, IEC approaches must be carefully and appropriately designed and selected.

Although good "one-to-one" communication at the point of service provision is essential for transmitting information and building trust with the client, communication with other individuals and groups within the community is also vital. It is through such communication networks that service providers can obtain information about users' needs, priorities and concerns. Such informal information gathering is the first step in assessing needs. It also helps providers better understand

the specific setting and context in which they are working, which will be useful in the later development of IEC approaches, messages and materials. Although good "one-to-one" communication at the point of service provision is essential for transmitting information and building trust with the client, communication with other individuals and groups within the community is also vital. It is through such communication networks that service providers can obtain information about users' needs, priorities and concerns. Such informal information gathering is the first step in assessing needs. It also helps providers better understand the specific setting and context in which they are working, which will be useful in the later development of IEC approaches, messages and materials.

### **Steps in developing IEC activities**

The information gathered through needs assessments provides the framework for the development of suitable IEC activities. Any activities and materials must always be culturally sensitive and appropriate. The major steps for designing an IEC activity as follow:

- 1) Conduct a needs assessment.
- 2) Set the goal. This is a broad statement describing the desired accomplishment within the target audience in the end.
- 3) Establish behavioral objectives that will contribute to achieving the goal.
- 4) Develop the IEC activities and involve as many other partners as possible.
- 5) Identify potential barriers and ways of overcoming them.
- 6) Identify potential partners, resources, and other forms of support activities and gain their sustained commitment.
- 7) Establish an evaluation plan.

Indicators should determine the level of achievement of the behavioral objectives. Having such specific indicators makes evaluating and monitoring the progress and impact of the activities much easier. Additionally, process indicators could be established to track to what extent and how well the planned activities have been carried out.

An objective must be **SMART**:

**S** pecific            what and who

**M** easurable something you can see, hear or touch-usually expressed with an action verb

**A** rea specific where

**R** ealistic achievable

**T** ime-bound when

### **IEC Messages**

There are several steps that need to be followed so that the IEC message is successful.

Develop IEC messages: A good message should short, accurate and relevant. It will make, at the most, 3 points. It should be disseminated in the language of the target audience and should use vocabulary appropriate for that audience. The message tone may be humorous, didactic, authoritative, rational or emotionally appealing. It may be intended as a one-time appeal or as repetitive reinforcement. It is often necessary to develop several versions of a message depending on the audience to whom it is directed. For example, information about contraceptive services will impact women who already have three or four children differently than adolescents who are just beginning to be sexually active. Their needs and priorities are different, so the IEC materials used with each group must also differ. Existing materials already implemented in the host country or country of origin should be used instead of developing new ones if appropriate.

Pre-testing: Trying out the materials with small groups from the larger target audience is an essential part of developing messages and educational materials. Pre-testing will ensure that people understand the message as intended. Pre-testing may need to be repeated frequently to ensure that information is being conveyed as desired.

Determine suitable methods and channels of action and communication: Once the target audience is identified and researched and the key messages have been chosen, it is time to decide which media and combinations of information channels will reach the target group. Both formal and informal groups can be targeted. Different channels do different jobs. Each has its own strengths and weaknesses, depending on the role it will take in the communication program. The choice of messages and media will be influenced by many factors: cost, literacy levels, artistic style within the community, familiarity with, and extent of penetration of a particular medium for both

service providers and users, and availability of the medium in the target population's community.

The development and refinement of messages and the choice of the communication channel or medium are inseparable. Very different messages will be developed for different media, for example radio, stories, poems, songs, posters or flip charts, for the nature of the medium affects what messages can be successfully used. The skills of those using the materials must also be considered. It may be necessary to provide training to those staff expected to use the materials. For example, it is important to recognize that placing a picture or poster on a clinic wall at which people may or may not look is quite different from using a series of pictures in the form of a flip chart as an educational tool in a group setting.

For IEC of any kind to be effective it must be linked with the availability of support and resources so target audiences can act in the manner which is being recommended. It is therefore essential that the content of any IEC program accurately reflect the nature and quality of the services provided. Logistical support must be adequate to ensure the necessary supplies (material and human) are consistently available and adequate training should be provided to health workers to support interpersonal communication and community follow-up. People must be able to act on the advice contained in the IEC messages and materials.

In summary, IEC can be defined as an approach which attempts to change or reinforce a set of behavior in a target audience regarding a specific problem in a predefined period of time. It is multidisciplinary and client-centered in its approach, drawing from the fields of diffusion theory, social marketing, behavior analysis, anthropology, and instructive design. IEC strategies involve planning, implementation, monitoring and evaluation. IEC creates awareness, increase knowledge, change attitudes and moves people to change or continue their behavior or to adopt and innovation.

## **2.5 RELEVANT RESEARCH**

Haynes *et al.*, (1996) conducted a systematic review of randomized trials of interventions that assists patients to follow prescriptions for medications. The studies were too disparate in clinical problems, adherence interventions, measures and

reporting of adherence, and clinical outcomes studied to warrant meta-analysis. For short-term treatments, one study showed an effect of counseling and written information on adherence and outcome. The interventions that were effective for long term care were complex, including various combinations of more convenient care, information, counseling, reminders, self-monitoring, reinforcement, family therapy, and other forms of additional supervision or attention. Even the most effective interventions did not lead to substantial improvements in adherence. Although adherence and treatment outcomes can be improved by certain, usually complex interventions, full benefits of medications cannot be realized at currently achievable levels of adherence. It is time that additional efforts are directed towards developing and testing innovative approaches to assist patients to follow treatment prescriptions.

McCombine (1996) reviewed literature on treatment seeking for malaria to identify patterns of care seeking, and to assess what was known about the adequacy of the treatments used. There was considerable variation in treatment seeking patterns, with use of the official sector ranging from 10–99% and self-purchase of drugs ranging from 4–87%. The majority of malaria cases received some type of treatment, and multiple treatments were common. The response to most episodes began with self-treatment, and close to half of cases relied exclusively on self-treatment, usually with antimalarials. A little more than half used the official health sector or village health workers at some point, with delays averaging three or more days. Exclusive reliance on traditional methods was extremely rare, although traditional remedies were often combined with modern medicines. In addition, it was important to determine the specificity of local illness terms in identifying true malaria cases and the extent to which local perceptions of severity were consistent with clinical criteria for severity and symptoms of complicated malaria.

Fungladda *et al.* (1998) conducted a randomized, controlled, malaria-clinic-based field trial; this study was conducted to compare compliance with two regimens for the treatment of uncomplicated falciparum malaria in a community in Thailand. Of 137 patients, aged 15-60 years attending a malaria clinic, 77 received artesunate and 60 received quinine + tetracycline. Compliance and cure rates were evaluated on days 5 (artesunate) and 7 (quinine + tetracycline) using patient interview/residual pill counts and peripheral blood smear, respectively. Reasons for compliance included the

desire to be cured and to follow the advice of malaria staff/employer, and the simple dosing regimen. Noncompliance was mostly due to adverse reactions and forgetting to take the drugs. This study recommend a strategy which integrates a short-course, once-a-day regimen (with minimal adverse reactions), a better delivery system for antimalarial drugs and health education, and an enhanced advisory role of malaria staff.

Okonkwo *et al.* (2001) conducted a study on if compliance to the correct dose of chloroquine in uncomplicated malaria correlated with improvement in the condition of rural Nigerian children. Chloroquine syrup was packaged with a novel pictorial insert for compliance to correct dosing. Compliance was assessed in a field trial, involving 632 children with uncomplicated malaria. There were 3 arms to the trial: control villages (group I) received chloroquine syrup without further intervention, group II received a pictorial insert with chloroquine syrup, and group III received chloroquine syrup, the pictorial insert and verbal instructions. Compliance was assessed by volumetric measurement of the chloroquine syrup left in 30-ml bottles and by questionnaires administered to mothers/helpers of the children. There was a significant correlation ( $P < 0.0001$ ) between full compliance, improvement and time to improvement in the health of the children. This study was unique in that pictorial instructions were used rather than written instructions, which would be extremely beneficial to illiterate patients who may not understand the use of age or weight in drug dispensing, and may consequently utilize substitutes or incorrect dosing.

Ansah *et al.* (2001) conducted a study on what improved adherence to malaria treatment in children: the use of pre-packed chloroquine tablets or the use of chloroquine syrup in sub-Saharan Africa. They investigated the impact of introducing pre-packed tablets for children on adherence to treatment and compared the total cost of the tablets with that of syrup. Children aged 0-5 years diagnosed with malaria at the clinic over a 6-week period received either pre-packed tablets or syrup by random assignment. The principal caregivers were interviewed at home on day 4 after attending the clinic. Of the 155 caregivers given pre-packed tablets, 91% ( $n=141$ ) adhered to the recommended dosage, while only 42% ( $n=61$ ) of 144 who were provided syrup did. Only 20% of caregivers who received syrup used an accurate 5 ml measure. The cost of treatment with tablets was about one-quarter that of syrup and

62% ( $n=96$ ) of caregivers preferred tablets. It was concluded that pre-packed chloroquine tablets are a viable alternative to syrup.

Agyepong *et al.* (2002) conducted a study to test the impact of a combination of improved information provision to patients and drug labeling on adherence to recommended anti-malarial treatment regimens focusing on oral chloroquine, for the outpatient management of acute uncomplicated malaria. This quasi-experiment was conducted as part of the activities of a District Health Management Team responsible for integrated primary health care delivery in a rural district in Ghana. The results showed that the intervention resulted in an improved flow of information to clients prescribed chloroquine, and better labeling of drugs for the home treatment of acute clinical episodes of malaria in the intervention area. Improvements in adherence occurred in all clinics. However, improvements in adherence were most marked in the clinic that was worst performing at the start of the intervention.

Sirima *et al.* (2003) studied the impact of the use of pre-packaged antimalarial drugs (PPAM), by mothers in the home, on the progression of disease in children from uncomplicated fever to severe malaria in malaria-endemic Burkina Faso, West Africa. In each village of one province, a core group of opinion leaders (mainly older mothers) was trained in the management of uncomplicated malaria, including the administration of PPAM. Full courses of antimalarial (chloroquine) and antipyretic (aspirin) drugs were packaged in age specific bags and made widely available through community health workers who were supplied through the existing drug distribution system. Disease history and the treatment received were investigated for all children under the age of 6 years having suffered from a fever episode in the previous 4 weeks. Uncomplicated malaria was defined as every episode of fever and severe malaria as every episode of fever followed by convulsions or loss of consciousness. The children under 6 years of age were treated promptly by mothers with the pre-packaged drugs made available by the study. A total of 59% of children receiving PPAM were reported to have received the drugs over the prescribed 3-day period, while 52% received the correct age-specific dose. PPAM use was similar among literate (61%) and non-literate mothers (55%). The findings supported the view that, after appropriate training and with adequately packaged drugs made available, mothers can

recognize and treat promptly and correctly malarial episodes in their children and, by doing so, reduce the incidence of severe disease.

Kilian *et al.* (2003) conducted a study on malaria related knowledge, attitudes, practices and beliefs in western Uganda. 813 women aged 15–49 years were shown a sample of a pre-packed, unit-dosed malaria treatment for children, its use was explained and attitudes of the women were investigated. Of all women, 90.5% (86% urban, 92% rural) said they would prefer the pre-packed over the conventional type of treatment and 93.9% of these were willing to pay between 0.17 (rural) and 0.29 (urban) US\$ more for this treatment. Two-thirds (67.8%) thought that they would not have to ask their spouses before making a decision on the kind of treatment and 59.5% said they would rather stock the treatment at home than buy it when a child gets sick. The most mentioned reason for preferring pre-packs was their safety and cleanliness, while ease of application, dosing and compliance were secondary. They concluded that pre-packed, unit-dosed malaria treatment were accepted by the caretakers of children in the area studied and that they readily understood and accepted its concept. This indicated a high potential for this approach to improve the home management of malaria fevers and reduce malaria-related morbidity and mortality if adequate coverage can be achieved and if the intervention was embedded into an appropriate program of behavioral change communication and provider training.

Tavrow *et al.* (2003) studied whether low-cost outreach education (vendor-to-vendor) program improved the private sector's compliance with malaria guidelines in Bungoma District, Kenya. The cornerstone of the program was the district's training of 73 wholesalers who were equipped with customized job aids for distribution to small retailers. Six months after training the wholesalers, the program was evaluated using mystery shoppers. The shoppers posed as caretakers of sick children needing medication at 252 drug outlets. Afterwards, supervisors assessed the outlets' knowledge, drug stocks, and prices. Results showed that the intervention seems to have had a significant impact on stocking patterns, malaria knowledge and prescribing practices of shops/kiosks, but not consistently on other types of outlets. About 32% of shops receiving job aids prescribed the approved first-line drug, sulfadoxine-pyremethamine, as compared to only 3% of the control shops. In conclusions, changing private sector knowledge and practices was widely acknowledged to be slow

and difficult. The vendor-to-vendor program seemed a feasible district-level strategy for achieving significant improvements in knowledge and practices of shops/kiosks.

Marsh *et al.* (2004) conducted a study on improving malaria home treatment by educating rural drug retailers in Kenya between 1998 and 2001. Impact was evaluated through annual household surveys of over-the counter (OTC) drug use and simulated retail client surveys in an early (1999) and a late (2000) implementation area. The program achieved major improvements in drug selling practices. The proportion of OTC anti-malarial drug users receiving an adequate dose rose from 8% (n = 98) to 33% (n = 121) between 1998 and 1999 in the early implementation area. By 2001, and with the introduction of sulphadoxine pyrimethamine group drugs in accordance with national policy, this proportion rose to 64% (n = 441) across the early and late implementation areas. Overall, the proportion of shop treated childhood fevers receiving an adequate dose of a recommended anti-malarial drug within 24 hours rose from 1% (n = 681) to 28% (n = 919) by 2001. These findings strongly supported the inclusion of private drug retailers in control strategies aiming to improve prompt effective treatment of malaria.

Kachur *et al.* (2004) conducted a study on adherence to antimalarial combination therapy with sulfadoxine-pyrimethamine and artesunate in rural Tanzania. Combination therapy through coadministration of sulfadoxine-pyrimethamine plus artesunate was introduced as a first-line treatment for uncomplicated malaria in one district in Tanzania. Interventions to optimize correct use were also implemented. They observed 453 patient encounters at one health facility and recorded key practices as health workers dispensed the combination. A total of 253 patients were followed-up at 24 or 48 hours. Complete adherence measured at 48 hours reached 75.0%, based on self-report and tablet counts. This was substantially better than reported elsewhere and compares favorably with intervention studies to optimize adherence to chloroquine. Counseling about what to do if a patient vomits appears to have been an independent risk factor for non adherence.

Depoortere *et al.* (2004) conducted a study on adherence to the combination of sulphadoxine-pyrimethamine and artesunate in the Maheba refugee settlement, Zambia. Children aged 5 years or younger with a confirmed diagnosis of uncomplicated falciparum malaria were treated with the combination of sulphadoxine-pyrimethamine

(1 day) and artesunate (3 days). To measure treatment adherence, home visits were carried out the day after the last treatment dose. Patients who had any treatment dose left were considered “certainly non-adherent”. The other classifications were based on the answers to the questionnaire: patients whose caretakers stated the child had received the treatment regimen exactly as prescribed were considered “probably adherent”, and all other patients were considered “probably non-adherent”. Reasons for non-adherence were assessed. They found 21.2% (95% CI [15.0–28.4]) of the patients to be certainly non-adherent, 39.4% (95% CI [31.6–47.6]) probably non-adherent, and 39.4% (95% CI [31.6–47.6]) probably adherent. Insufficient explanation by the dispenser was identified as an important reason for non-adherence.

Yeung and White (2005) reviewed the literature on how patients use antimalarial drugs. They reviewed available published evidence on adherence to antimalarial drugs and community drug usage; 24 studies were identified, of which nine were ‘intervention’ studies, seven were classified as ‘outcome studies’, and the remainder were purely descriptive studies of antimalarial adherence. Definitions, methods, and results varied widely. Adherence was generally better when treatments were effective, and was improved by interventions focusing on provider knowledge and behavior, packaging, and provision of correct dosages. There was insufficient information on this important subject, and current data certainly do not justify extrapolation from results with ineffective drugs to new effective treatments. Research in this area would benefit from standardization of methodologies and the application of pharmacokinetic modeling.

Kolaczinski *et al.* (2006) carried out a study in Uganda on whether improved access to prompt, effective antimalarial treatment of all fevers in children less than 5 years improved home-based management of fever (HBMF). Implementation was through community drug distributors (CDDs) who distribute pre-packaged chloroquine plus sulfadoxine-pyrimethamine (HOMAPAK<sup>®</sup>) free of charge to caretakers of febrile children. A questionnaire-based survey combined with inspection of blister packaging was conducted to investigate caretakers' adherence to HOMAPAK<sup>®</sup>. A total of 241 caretakers were interviewed. 95.0% (CI: 93.3% – 98.4%) of their children had received the correct dose for their age and 52.3% of caretakers had retained the blister pack. Assuming correct self-reporting, the overall adherence was 96.3%. The nine

caretakers who had not adhered had done so because the child had improved, had vomited, did not like the taste of the tablets, or because they forgot to administer the treatment. For 85.5% of cases treatment had been sought within 24 hours. Blister packaging was considered useful by virtually all respondents, mainly because it kept the drugs clean and dry. Information provided on and inside the package was of limited use, because most respondents were illiterate. However, CDDs often told caretakers how to administer the treatment. For 39.4% of respondents, consultation with the CDD was their reported first action when their child has fever and 52.7% stated that they consulted her/him if the child did not get better. The investigators concluded that in case of febrile illness, most caretakers obtained prompt and adequate antimalarial treatment, and adhered to it. Implementation in the IDP camps needed to focus on improving monitoring, supervision and general support to CDDs, as well as on targeting them and caretakers with educational messages.

## **CHAPTER III**

### **METHODOLOGY**

This chapter presents a description of the research methodology used in this study, including the research design, study sites, populations and samples, research process and intervention, research instruments, data collection, and data analyses.

#### **3.1 RESEARCH DESIGN**

The design of this research was quasi-experimental with pre-test and post-test in two study groups: an intervention group and a control group. The intervention group received the Information, Education, and Communication (IEC) program, carried out through participatory learning and action methods. The Control Group only received current standard routine for malaria therapeutic treatments at malaria clinics.

#### **3.2 STUDY SITES**

The research locations were located in rural areas with high incidences of vivax malaria cases and have malaria clinics (MC) within access to the local populations. The study was carried out in areas serviced by twelve MCs in Mae Hong Son Province, Northern Thailand, with three clinics located in Mae Sa Riang District and nine in Muang District. The areas are mountainous and forested with limited fertile lowland areas for growing agricultural crops. Large numbers of the rural population earn their living from growing upland crops, trading or becoming farm/non-farm wageworkers. The two districts are classified as high malaria transmission areas (A1).

Annual Parasite Incidence (API) rates are high in these districts, two of them ranking first and third in the Province in 2005. There were 182 vivax malaria cases in Mae Sa Riang and 197 cases in Muang district in that year. The research has been conducted with all nine MCs in the Muang District as the Intervention Group and the three MCs in Mae Sariang District as the Control Group.

The selected areas are of mixed Thai and ethnic population of the Karen, Thai Yai, and other hilltribes. These communities live contiguous to one another in the Mae Sa Riang and

Muang Districts. The Karen and Thai Yai have cultures, including language dialects, superstitions and spiritual belief systems, that are unique and that differ from those of the common “lowland” Thai population. These areas were also selected because it was hypothesized that treating patients from these diverse populations added another dimension of complexity to accomplishing successful treatments of vivax malaria cases.

### 3.3 POPULATION AND SAMPLE SIZE

**3.3.1 Study populations:** The Target Population for this research study was vivax malaria patients living in the vicinity of the MCs in Muang and Mae Sa Rieng Districts. The people in these areas were at equal risk to contract malaria. Generally, when a person in the Target Population suspected that they had malaria (or any illness), they could go to the provincial hospital, district hospitals, health centers, malaria clinics, and community malaria clinics to check their blood and to receive treatment. The local populations preferred to have their blood checked at the MC, as it was free of charge there. Populations in this study included all cases of *P. vivax* infection, whether diagnosed at MC or community MC in the two Districts.

The study also included staff at the twelve MCs that participated in the IEC program. The eighteen staff at the MCs has been involved in designing and implementing new treatment and health education methods and tools that has been developed as part of this research (as the IEC Program).

**3.3.2 Calculation of sample size:** The study included equal numbers of intervention and control group. In 2004, the non-compliance rate of malaria medication in Thailand was 30% ( $p_1 = 0.3$ ) (Unpublished data). Our goal was to reduce the non compliance rate by 50% (then  $p_2 = 0.15$ ) with a power of 80% and a significance level of 0.05. The minimum requirement for the study samples for each group was depended on the number computed from the formula. The required sample size will be derived from a formula outlined by Rosner (2000) as follow:

$$p_1 = 0.30, p_2 = 0.15, q_1 = 1-p_1 = 1-0.30 = 0.70, q_2 = 1-p_2 = 1-0.15 = 0.85, k = 1$$

$$\Delta = |P_1 - P_2| = |0.30 - 0.15| = 0.15$$

$$\bar{p} = \frac{p_1 + k p_2}{1+k} = \frac{0.30 + (1)(0.15)}{1+1} = 0.225$$

$$\bar{q} = 1 - \bar{p} = 1 - 0.225 = 0.775$$

$Z_{1-\alpha/2}$  = Value of the standard normal distribution corresponding to alpha: 1.96 for the two-sided test at 0.05

$Z_{1-\beta}$  = Value of the standard normal distribution corresponding to the desired power level: 0.84 for a power of 80%

$$\begin{aligned} n_1 &= \left\{ \left( \bar{p} \bar{q} (1+1/k) \right) z_{1-\alpha/2}^2 + \left( p_1 q_1 + (p_2 q_2)/k \right) z_{1-\beta}^2 \right\} / \Delta^2 \\ &= \frac{(1.157 + 0.487)^2}{(0.15)^2} \\ &= 121 \text{ patients per group} \end{aligned}$$

Based on this calculation, the number of the sample subjects needed to be at least 121 vivax malaria patients for the intervention group of patients attending MC in Muang District. The Control Group of 121 vivax cases in Mae Sa Rieng District was selected using the same criteria as for the intervention group. In total, the study needed to recruit 242 vivax malaria patients.

As the number of vivax malaria patients varied with the fluctuations in the seasonal variation of vivax malaria transmission, it was uncertain that the 242 vivax malaria patients necessary could be included in the study. During the months with more precipitation (May to August), the number of malaria cases typically are higher. As previously noted, in 2005 there were a total of 379 malaria patients in the two district area of this research. To obtain a statistically valid sample size under the Rosner (2000) formula, this study needed to recruit roughly two thirds of all of the vivax malaria patients for the entire year in only a six month period.

Given the improbability of recruiting such a large portion of the malaria patients, the research design was modified using a calculation for determining a reduced, but appropriate sample size. As this research was designed to detect a difference of a 50% reduction in the total number of malaria patients not adhering to the treatment regimen, the sample size was calculated based on the desired difference to detect as seen in the table below. As noted by Stenning & Parmar (2002), the targeted size to detect a

difference was the most important driving factor in identifying the statistically valid sample size. If we kept the value of power constant at 0.80, a preferred number of the study population for each group will be 75 to 100 persons.

Sample size per group	Power	Difference to detect
50	0.80	0.23
75	0.80	0.19
100	0.80	0.16
125	0.80	0.14
150	0.80	0.13

### 3.3.3 Inclusion criteria

- 1) Permanent resident of Thailand.
- 2) Not planning to move out from the district during the period of study.
- 3) Able to listen, speak and communicate in Thai and native languages.
- 4) Willing to participate throughout the duration of the study

### 3.3.4 Exclusion criteria

- 1) Immigration status as a temporary resident.
- 2) Pregnant woman.
- 3) Not willing to participate in the study.

## 3.4 Research process and intervention

The study was divided into three phases: preparation phase, intervention phase, and evaluation phase.

### 3.4.1 Preparation phase consists of six stages as follows:

1) **Preliminary study:** The goal of this phase was to identify the main factors influencing adherence and non adherence with vivax malaria treatment, such as socio-economic characteristics, knowledge, belief and perception, behavioral factors in relation to malaria treatments. The data was gathered from patients who attended malaria clinics during 1 October 2005 to 30 September 2006 by using a structured questionnaire and focus group discussion (see Appendix A). The questionnaire and the focus group

discussion enabled the researcher to identify patients who completed and did not complete their anti-malaria drug treatment. Chi-square test, odds ratio and its 95 percent confidence interval were calculated in order to test the association between adherence of vivax malaria patients and socio-demographic characteristics, knowledge of malaria, perception on malaria, drug taking behaviors, family supports, and satisfaction towards malaria health services. Multiple logistic regression analysis was performed to predict factors influencing adherence to malaria treatment in this study. The researcher also reviewed and assessed existing materials and health education strategies produced by local malaria officers. This information was used as a starting point to develop IEC materials and appropriate intervention strategies, as well as to develop communication channels to further encourage patients to comply with anti-malaria drug treatments.

**2) Preparation of the empowerment training program (ETP):**

Preparation of the ETP for malaria officers on the Information Education and Communication (IEC) strategy was performed by the Researcher by having focus group discussions with malaria workers regarding health education practices for vivax malaria patients and by observing malaria workers providing health education to vivax malaria patients. The ETP was a continuing educational program intended to empower the malaria officers through active participation in this study, with the ultimate goal of improving adherence to malaria treatment. Contents of the training program included general knowledge on malaria, diagnosis and treatment, and prevention and control of malaria. The ETP also included team building, leadership, skill, problem solving, identification of possible IEC materials, health educational service skills, and how to set a plan, monitoring and evaluation for malaria treatment and drug compliance in the study population. Participatory learning, small group discussion, brainstorming, and interviewing techniques were also used in this program. The multidisciplinary teams included the Researcher, advisors, research assistants, local malaria workers, vivax malaria patients, and health volunteers. A three-day training program was conducted on the information obtained from the situation analysis and simplified to enhance the learning outcome. Technical assistance and social support was provided to the participants in this phase.

**3) Organizing the ETP:** the specific objectives of ETP were to enhance malaria officers'; 1) self-esteem; 2) learning and understanding properly more

about other people; 3) skills to work with other persons; 4) skills for self empowerment; 5) knowledge regarding empowering the target population; and 6) skills to plan and organize activities aimed at developing IEC packages to change behaviors of vivax malaria patients. The researcher and team carried out the ETP process. Only the 17 malaria officers involved in the IEC package training as well as having patient contact were eligible for the evaluation of the ETP. The self-administered questionnaire was used to collect data before, during, and after the training program. The questionnaire was composed of four parts:

**Part 1: General information** such as age, gender, marital status, educational level, fluency in language(s), income, and years of experience.

**Part 2: Self-esteem**, measuring self-value, ability achievement, pride and satisfaction with the jobs. The scoring system was as follows:

	<b>Agreed</b>	<b>Unsure</b>	<b>Disagreed</b>
Score	3	2	1

**Part 3: Self-efficacy and IEC skills** such as the ability to plan the IEC program, participate in IEC developing media/material and guidelines, implement the IEC plan, and evaluate the program.

	<b>High</b>	<b>Moderate</b>	<b>Low</b>
Score of self-efficacy	3	2	1
	<b>Able</b>	<b>Unsure</b>	<b>Unable</b>
Score of IEC skills	3	2	1

**Part 4: Jobs satisfaction** of malaria officers, including assessments of the professional environment, autonomy, work worth, professional relations, and role enactment. The scoring system was as follows:

	<b>High</b>	<b>Moderate</b>	<b>Low</b>
Score	3	2	1

**4) IEC intervention development:** After gaining information collected from the preliminary study on determinant factors, the researcher organized a workshop to develop prototypes of IEC materials and guidelines and appropriate interventions or strategies that were tailored to the population as well as user-friendly to further

encourage patients to comply with anti-malaria drug treatment. The participants of this workshop included researchers, advisors, malaria officers, vivax malaria patients, and health volunteers.

Conception of the IEC intervention involved tailoring health messages, materials, and interventions to the cultural beliefs, perception and characteristics of the target populations without which interventions could produce only incomplete results. In this study, the intervention has been developed on the basis of outcomes from the preliminary study.

**5) Pre-testing of IEC materials and guidelines:** The IEC intervention has been written into multilingual dialects (Thai and local languages). It was pre-tested among target populations in a selected MC outside the study area and also pre-tested with the secondary beneficiaries such as malaria officers. Objectives of the pre-testing were to assess the validity, reliability, and acceptance by users (patients) and malaria officers. The pre-testing also provided information on the administrative capacity requirement for the intervention. Feedback was then used to revise the intervention as needed.

**6) Finalizing the prototype of the IEC intervention:** The researcher conducted a workshop to finalize IEC intervention. Again, feedback was then used to revise the intervention as needed.

**7) A two-day training workshop** was set up for the purpose of standardizing the IEC package with the malaria officers before implementing it.

**3.4.2 Implementation phase:** The diagram of this phase was designed as follow:

O <sub>1</sub>	X	O <sub>2</sub>	for the intervention group
O <sub>3</sub>		O <sub>4</sub>	for the control group

Where:

- O<sub>1</sub> was to observe/investigate the patients before drug treatment and implementation with the IEC package
- O<sub>2</sub> was to observe/investigate the patients after 14 days of the treatment and implementation with the IEC package
- O<sub>3</sub> was to observe/investigate the patients before drug treatment
- O<sub>4</sub> was to observe/investigate the patients after 14 days of the treatment
- X was an implementation of IEC packages among vivax malaria patients

1) Patients diagnosed with vivax malaria infection in the intervention settings (malaria clinics in Muang district) were interviewed with the structured questionnaire at O<sub>1</sub> and O<sub>2</sub>

2) Patients diagnosed with vivax malaria infection in the control settings (malaria clinics in Mae Sa Riang district) were also interviewed with the same structured questionnaire at O<sub>3</sub> and O<sub>4</sub>

3) All patients received treatment with drugs under the same regimen set by Ministry of Public Health policy (chloroquine 2,500 mg divided into 3 days and primaquine 15 mg per day for 14 days).

4) The IEC materials and guidelines were administered to vivax malaria patients in the intervention settings at “X”.

5) All patients were required to return for follow-up blood check at the same malaria clinics on day 14 (a usual follow up was performed under the disease control policy).

### **3.4.3 Assessments**

The goal of this phase was to determine the factors for success and failure of the IEC program in improving patient compliance to treatment. The comparisons were done through interviews with the patients in the post-intervention (O<sub>2</sub> vs. O<sub>4</sub>) using the same questionnaire as pre-intervention. The group comparisons measured the different behavioral changes in the intervention group, and in the control group (O<sub>1</sub> vs. O<sub>2</sub>, and O<sub>3</sub> vs. O<sub>4</sub>).

## **3.5 Research instruments**

**3.5.1 Guidelines for focus group discussion with vivax malaria patients** regarding anti-malarial drug taking behaviors, problem and obstacles, and health care service at malaria clinics.

**3.5.2 Field instruments:** tape recorders, notebooks, and cameras.

**3.5.3 A structured questionnaire for the vivax malaria patients:** This set consisted of six parts as follows:

**Part 1: General information:** This part contained questions about genders, ages, ethnicity, ethno-linguistics, residential status, income, educational levels, house

environment and occupations. Most of the questionnaire was designed with closed-ended questions and contains few open-ended questions.

**Part 2: Knowledge regarding malaria:** This part contained fifteen items that consisted of questions regarding disease transmission, signs and symptoms of malaria, prevention and control methods. Each item was given one point if the respondent answered correctly and zero point if they answered incorrectly. According to Bloom (1979), the knowledge scores were categorized in to three levels as follow:

Level of knowledge	Percent	Score
Low	0-59	0- 8
Moderate	60-79	9-11
High	80-100	12-15

**Part 3: Perceptions toward malaria and malaria treatment:** Some of this section followed a Likert scale, constructed with three levels as follows: “Agreed”, “Not sure”, and “Disagreed”. In addition, the possible ranges of perception were categorized into three levels similar to the knowledge score in part 2. The score system was applied as follow:

Positive statement	Negative statement
Agreed score = 3	Agreed score = 1
Not sure score = 2	Not sure score = 2
Disagreed score = 1	Disagreed score = 3

Level of perception	Percent	Score
Low	0-59	0-27
Moderate	60-79	28-35
High	80-100	36-30

**Part 4: Self-efficacy:** These questions related to how confident patients felt about adhering to the treatment regimen and avoiding side effects of the treatment. A 3-level Likert scale was used. The total score was summed, and with 15 items in this part, a score range of 15-45 was possible. This summary score was grouped into 3 levels based on the following criteria:

Level of self-efficacy	Percent	Score
Low	0-59	0-27
Moderate	60-79	28-35
High	80-100	36-45

**Part 5: Access to information on antimalarial medications:** This part also assessed how clear the instructions for the medication was, whether the packaging was convenient to use, if the patient recognized the difference between chloroquine and primaquine and the different frequencies for each, if the patient experienced side effects and if it altered adherence, whether the duration of treatment was too long, and whether the patient attended the required follow-up appointment to determine parasite clearance. The total score composed of 8 items in this part, a score range of 0-8 was possible. Each item was given one point if the respondent answered correctly and zero point if they answered incorrectly.

**Part 6: Adherence to antimalarial medications:** A self-report administration from questionnaire interview measured adherence to the treatment. A patient is said to have adhered if they follow the medication instructions exactly. A score of 1 indicated complete the medication, and a score of 0 indicated incomplete adherence.

**Part 7: Satisfaction and cooperation with health services at malaria clinics:** A set of Likert scale measured levels of satisfaction with the health services offered at the malaria clinics. The scores were then summarized and categorized similar to the scores in the knowledge section.

### 3.6 Validity and reliability of the questionnaire

The research instrument was a set of structured questionnaires developed under supervision of the research advisors, and with the guidance of established guidelines and published literature. The team performed a pre-testing of the questionnaires before the implementation with a group of 30 vivax malaria patients in Chiangmai province having similar geographical characteristics to those of the study setting in Mae Hong Son. Validity and reliability were assessed to standardize the scales used in the questionnaire. Consulting experts critiqued the validity, while an assessment of reliability used the Cronbach's alpha coefficient (Rosenthal and Rosnow, 1991) using both average reliability

and alpha if an item was deleted. The results of Cronbach's alpha analysis were used to improve or to adjust the scale items. The results of the analysis are as follows:

1. Knowledge of malaria: The alpha reliability of 15 items was 0.82.
2. Perception on malaria and malaria treatment: The alpha reliability of 15 items was 0.61.
3. Self-efficacy: The alpha reliability of 15 items was 0.71
4. Access to information on anti-malarial medications: The alpha reliability of 8 items was 0.64.
5. Satisfaction and cooperation with health services at malaria clinics: The alpha reliability of 27 items was 0.91

In this study, structured questionnaire set 1 was used for interviewing vivax malaria patients and self-administrative questionnaire set 2 was used for malaria officers in phase I. For phase II, the structured questionnaire set 3 was used for interviewing vivax malaria patients in the control group and the intervention group two times (Pretest: O<sub>1</sub> VS O<sub>3</sub> and Posttest day 14: O<sub>2</sub> VS O<sub>4</sub>)

#### **Quality assurance for interviewers in the use of questionnaire**

1. Prior to data collection, five recruited interviewers who had background malaria knowledge were trained in the objectives of study, contents of the questionnaire and comprehension of the questions, verbal interview techniques, and data collection procedures. All of them were able to communicate in Thai and in native languages and to participated through the duration of the study.

2. All interviewers were trained and tested by the researcher before pre-testing the questionnaire. Interviewers crosschecked each other in order to look at missing points and to correct each other. Interviewers pre-tested again until they met qualified standards needed for good repeatability and reliability.

3. All interpreters received training at the same time with the interviewers while the trainer had taught them some simple scientific terms and crosschecked the meaning between the both such as malaria symptoms, primaquine, and chloroquine. One interpreter accompanied an interviewer to interview the patient throughout the study. All interviewers were able to listen terms/dialects of native languages, but they might not speak as well as the interpreters.

4. Before asking questions, the patients were informed of the consent process and consent form. The interviewer explained the objectives of the study and asked if the patient was willing to participate this research.

5. A supervisory team visited interviewers to give suggestions and to check the questionnaire for inconsistencies and missing information every week.

### **Quality assurance for the IEC program**

The control of an internal quality performed an assurance for qualified standards during the study. The researcher developed a standards chart for the IEC process that assessed the performance of each provider. An evaluation of IEC performance was conducted every month during the preliminary study (at the IEC workshop) and during the implementation. Individual quality assurance charts that tracked quality scores were kept for each malaria officer. The researcher also observed malaria officers giving IEC packages to vivax malaria patients at random and checked whether they followed IEC standard or not. Feedback was given to the malaria officers at monthly meeting, so that continuous quality improvement could occur.

### **Quality assurance for the IEC materials**

Before implementation the IEC program, the researcher tested tailored IEC materials including posters, pamphlets, flipcharts, and drug bags with the vivax malaria outside the study area to assess comprehension, validity, reliability, and acceptance among vivax malaria patients (user) and malaria officers (health care provider). Revision of IEC materials did for three times in order to improve upon their use-friendliness and message comprehension.

## **3.7 Data collection**

We collected quantitative and qualitative data from the patients in malaria clinics at Mae Sa Riang and Muang districts. The collection of quantitative data used a structured interviewer-administered questionnaire. Interview with questionnaire administered two times: the pretest (O<sub>1</sub> and O<sub>3</sub>) at day 1 and the posttest at day 14 (O<sub>2</sub> and O<sub>4</sub>). In the posttest, interviewers questioned the vivax malaria patients whether they exactly followed the medication instructions retrieved from malaria officers according to the National Drug Treatment Guidelines for the vivax malaria patients.

### **3.8 Data analysis**

The information obtained from the complete questionnaires were managed and cleaned. Data was processed and analyzed using STATA statistical software program version 8.0 (Stata, Inc., College Station, TX, USA). All statistical tests were two-sided with a significance level of  $\alpha = 0.05$ . The results of the analysis were presented according to the following categories.

1) Descriptive statistics, including frequency, mean, standard deviation, and percentages, were performed to describe general information of the study population.

2) Inferential statistics:

2.1 Paired t-tests were performed to compare the mean differences in knowledge scores, perception of malaria scores, and self-efficacy related to anti-malarial drug taking behaviors scores before and after the implementation, stratified by intervention and control groups.

2.2 Student t-tests were performed to compare the mean differences in knowledge, perception of malaria, self-efficacy related to anti-malarial drug taking behaviors scores between the intervention and the control group, stratified by before and after implementation.

2.3 ANOVA was performed to compare the mean differences in self-esteem scores, self-efficacy scores, health education service skill on IEC process and IEC structure of malaria officers before, during, and after the empowerment training program.

### **3.9 Protection of Human Subjects**

The researcher explained the purpose of the study to all study subjects. The participants were informed of the consent process. They had right to refuse participation in the study and could stop participation at any time. They received medical services as usual. The researcher gave the informed consent form to the participants and was available to answer any questions. Participants were assured that all data obtained from the study will remain confidential. The participant signed the consent form if they agreed to the consent process and wanted to participate. Ethical clearance was approved by the Faculty of Tropical Medicine, Mahidol University.

### **3.10 Research Fund**

This study received financial support from the Royal Golden Jubilee PhD Program, Thailand Research Fund (Grant No. PHD/0232/2547).

## **CHAPTER IV**

### **RESULTS**

The study used a quasi-experimental design to assess the effectiveness of an information, education, and communication (IEC) program on drug adherence behaviors among the vivax malaria patients in two districts of Mae Hong Son province. According to the research objectives, the findings are divided into five parts as follows:

Part I: Findings of crucial behavioral factors influencing adherence or non-adherence to drug treatment in the vivax malaria patients.

Part II: The study of a capability building toward the malaria officers after participation of the empowerment training program (ETP) regarding self-esteem, self-efficacy, health education skills, and job satisfaction after they learned the information, education, and communication (IEC) packages that used to implement for the vivax malaria patients.

Part III: A qualitative analysis on the perceptions of the IEC program among malaria officers in the intervention setting.

Part IV: Analysis to determine if the IEC program has a role in changing knowledge of malaria, perception on malaria, self-efficacy, service satisfaction, and adherence to anti-malarial drug treatment among vivax malaria patients.

Part V: The qualitative analysis of drug taking behaviors among vivax malaria patients after receiving the IEC program.

#### **Part I: Crucial behavioral factors influencing adherence and non-adherence to drug treatment in vivax malaria patients.**

Part I describes the results of a retrospective study of behavioral factors that are associated with adherence to anti-malaria treatments. We surveyed 206 patients, 128 in Muang district and 78 in Mae Sa Riang district in Mae Hong Son province, diagnosed with vivax malaria infection between January 1, 2005 – July 30, 2006 (Table 5).

**Table 5** Number and percentage of study patients recruited from each malaria clinic in the study areas in Muang, and Mae Sa Rieng Districts, Mae Hong Son Province, 2005-2006.

Study malaria clinics	Data collection areas				Total	
	Muang		Mae Sa Rieng		N	%
	N	%	N	%		
Pang Mu	59	46.1	-	-	59	28.6
Pha Bong	29	22.7	-	-	29	14.1
Muang	8	6.2	-	-	8	3.9
Mai Dua Ghom	8	6.2	-	-	8	3.9
Pa Lan	8	6.2	-	-	8	3.9
Huai Sua Tou	7	5.5	-	-	7	3.4
Ban Klang	5	3.9	-	-	5	2.4
Mai Sa Pei	3	2.3	-	-	3	1.5
Huai Pong	1	0.8	-	-	1	0.5
Mae Sa Rieng	-	-	50	64.1	50	24.3
Ban Gard	-	-	28	35.9	28	13.6
Total	128	62.1	78	37.9	206	100.00

The results showed that 23.8% of vivax malaria patients adhered to the 14-day anti-malarial medication while 76.2% did not adhere. The majority of respondents were male (64.6%). The median age was 36 years old, with the youngest age 11 and the oldest age 88. About 66.0% were married. Approximately 57.3% had at least 4 years of formal schooling. In ethnicity, the Karen represented the highest proportion at 39.8%. Among the patients, the dialects used were Thai, Karen and Thai Yai. The median income was 1,350 Baht per month. 52.3% of the patients had income over or equal to 1,000 Baht (US\$30) per month. Occupationally, 64.1% were farmers raising rice and other cash crops. The average family size was four persons (Table 6).

To identify social factors that may be associated with adherence, comparisons were made between the adherence and non-adherence groups. In bivariate analyses, those who had forest-related occupations were 2.0 times more likely to comply to treatment than those

in non-forest related occupations, with a p-value that closely approaches statistical significance ( $p=0.056$ ). Other factors, including age, ethnicity, language used, educational level, monthly income, and number of family members, were not significantly associated with adherence to anti-malarial drugs. Regarding gender, drug adherence in the male was 0.7 times of that of the female. The odds ratio of drug adherence in the age group of older than or equal to 36 years old was 1.5 times greater than that of the group younger than 36 years. About the educational level, the odds ratio of drug adherence of the patients who had a schooling was 1.55 times greater than those who never had a schooling. The patients who spoke other tribe dialects (Karen, Thai Yai, and Burmese) had 0.76 times compared with those who spoke Thai. Those with income  $\geq 1000$  Baht per month had drug adherence 0.92 times compared to those having income  $< 1000$  Baht per month. (Table 6).

**Table 6** Association between demographic characteristics of vivax malaria patients and drug adherence, Mae Hong Son Province, Northern Thailand, 2006.

Factors	Non-adherence (76.21%)		Adherence (23.79%)		Total (100%)		OR	95%CI	p-value
	N	%	N	%	N	%			
Total	157		49		206				
Gender									
Male	98	62.4	35	71.4	133	64.6	1.0*		
Female	59	37.6	14	28.6	73	35.4	0.7	0.3-1.4	0.249
Age groups (years)									
< 36	79	50.3	20	40.8	99	48.1	1.0*		
$\geq 36$	78	49.7	29	59.2	107	51.9	1.5	0.7-3.0	0.245
Median=36.0, S.D.=15.6, Min=11, Max=88									
Ethnicity									
Thai	39	24.8	12	24.5	51	24.8	1.0*		
Non-Thai	118	75.2	37	75.5	155	75.2	0.9	0.5-2.4	0.960
Language used									
Thai	54	34.4	20	40.8	74	35.9	1.0*		
Others	103	65.6	29	59.2	132	64.1	0.8	0.4-1.6	0.413
Occupation									
Non forest related	62	39.5	12	24.5	74	35.9	1.0*		
Forest related	95	60.5	37	75.5	132	64.1	2.0	0.9-4.6	0.056

**Table 6** Association between demographic characteristics of vivax malaria patients and drug adherence, Mae Hong Son Province, Northern Thailand, 2006 (cont.).

Factors	Non-adherence (76.21%)		Adherence (23.79%)		Total (100%)		OR	95%CI	p-value
	N	%	N	%	N	%			
Educational level									
No schooling	71	45.2	17	34.7	88	42.7	1.0*		
Primary schooling and above	86	54.8	32	65.3	118	57.3	1.5	0.8-3.2	0.193
Income per month (Baht)									
< 1,000	74	47.1	24	49.0	98	47.6	1.0*		
≥ 1,000	83	52.9	25	51.0	108	52.4	0.9	0.5-1.8	0.821
Median=1,350, S.D.=3045.81, Min=0, Max=24,000									
Number of family member (persons)									
1-4	103	65.6	29	59.2	98	47.6	1.0		
5-10	54	34.4	20	40.8	108	52.4	1.3	0.6-2.7	0.413
Mean=4, S.D.=1.70, Min=1, Max=10									

\* Reference group

The differences in knowledge of malaria variables among the adherent and non-adherent groups are shown in Table 7. In questions regarding malaria transmission, the adherent patients were more likely to correctly answer that a mosquito bite was the cause of malaria infection (87.8% correct for adherent patients, 70.1% correct for non-adherent patients, p-value=0.015). However, non-adherent patients were more likely to answer correctly that malaria could not be contracted by drinking water containing mosquito larvae (46.9% vs. 75.8%, p-value=0.000), by drinking raw ground water from a stream in the forest (51.0% vs. 77.7%, p-value=0.001), or through supernatural forces (85.7% vs. 96.8%, p-value=0.009). In questions regarding known breeding sites for malaria vectors, adherent patients were more likely to answer correctly that a slow running stream is a breeding site (55.1% vs. 28.7%, p-value=0.001), that animal footprints are potential breeding sites (73.5% vs. 51.6%, p-value=0.008), that stagnant water in the house is not a breeding site (63.3% vs. 38.9%, p-value=0.003), and that stagnant water around the house is not a breeding site (69.4% vs. 52.2%, p-value=0.047). In questions regarding protective measures against malaria, both adherent and non-adherent groups were equally likely to

correctly answer that sleeping under ITN, spraying homes with pesticides, wearing long clothing, and using mosquito coils are protective measures against malaria. However, adherent patients were more likely correctly answer that sleeping under a mosquito net (85.7% vs. 66.2%, p-value=0.011) and using mosquito repellent (77.6% vs. 61.1%, p-value=0.040) are protective against malaria. Finally, both adherent and non-adherent patients are equally knowledgeable about the signs and symptoms on malaria. Both groups recognized equally that fever, headaches and shivering are the main signs and symptoms of malaria.

**Table 7** General knowledge of malaria and drug adherence among vivax malaria patients, Mae Hong Son, 2006.

Knowledge of malaria	Number who Answered				p-value
	Correctly				
	Non-adherent	Adherent			
	N	%	N	%	
Total	157	100.0	49	100.0	
<b>Knowing malaria transmission</b>					
- Mosquito bite	110	70.1	43	87.8	0.015
- Drinking water containing mosquito larvae is not a risk factor for malaria	119	75.8	23	46.9	0.000
- Drinking raw water from a stream in the forest is not a risk factor for malaria	122	77.7	25	51.0	0.001
<b>Knowing breeding sites of malaria vectors</b>					
- A slow running stream is a breeding site	45	28.7	27	55.1	0.001
- Animal footprints are a breeding site	81	51.6	36	73.5	0.008
- Stagnant water in the house is not a breeding site	61	38.9	31	63.3	0.003
- Stagnant water around the house is not a breeding site	82	52.2	34	69.4	0.047
<b>Knowing protective methods against malaria</b>					
- Sleeping under mosquito net	104	66.2	42	85.7	0.011
- Sleeping under ITN is protective against malaria	127	80.9	43	87.8	0.388
- Spraying house with chemical pesticides	87	55.4	34	69.4	0.097
- Using mosquito repellent	96	61.1	38	77.6	0.040
- Burning mosquito coils	100	63.7	33	67.3	0.733
<b>Knowing main signs and symptoms of malaria</b>					
- Headaches	133	84.7	45	91.8	0.241
- Fever	138	87.9	47	95.5	0.173
- Shivering	130	82.8	43	87.8	0.507

To summarize knowledge of malaria, the 15 questions were scored and summed. The possible range of the summarized knowledge scores was between 5 and 15. The scores were categorized into 2 levels, high (score between 10 and 15) and low (score between 5 and 9). The results can be seen in Table 8. The mean score of the general knowledge of malaria among the vivax malaria patients was 10.36. Among adherent patients, 63.3% scored at the high level whereas among the non-adherent patients, 45.2% scored at the high level ( $\chi^2=4.863$ , p-value=0.033). In terms of odds, those who had a higher malaria knowledge score were 2.1 times more likely to adhere to anti-malarial treatment than those who scored lower (95% CI=1.0-4.3).

**Table 8** Association between knowledge scores and drug adherence among vivax malaria patients, Mae Hong Son province, 2006.

Knowledge of malaria	Non adherence		Adherence		OR	95%CI	p-value
	N	%	N	%			
Total	157	100.0	49	100.0			
Low (5-9)	86	54.8	18	36.7	1.0		
High (10-15)	71	45.2	31	63.3	2.1	1.0-4.3	0.027
Mean	10.28		10.63				
S.D.	1.89		2.12				
Mean=10.36, S.D.=1.95, MIN=5, MAX=15							
$\chi^2$ test=4.863 df=1 p-value=0.033							

Table 9 summarizes the 15-item perception of malaria questions categorized by adherent and non-adherent vivax malaria patients. Among the 15 questions, only 3 were answered differently between adherent and non-adherent patients. When asked if one should take time off from work to have blood checked for malaria, 61.2% of the adherent patients answered yes, while only 41.4% of the non-adherent answered yes (p-value=0.035). When asked if headache, fever and weakness should lead one to suspect that it is malaria, 93.9% of the adherent patients answered yes, while only 75.2% of the non-adherent answered yes (p-value=0.007). Finally, when asked if insecticide spraying should be done solely in a malaria patient's house, 44.9% of adherent patients said yes, while 56.7% of non-adherent patients said yes (p-value=0.002).

To summarize the perception questions, the answers were summarized by 4 subcategories of the perception questions (Table 10). The perception of susceptibility,

perception of severity, and perception of benefits scores were summed and categorized as poor perception (score of less than 10) and good perception (score of 10+). Similarly, the perception of barrier score was summed and categorized as poor perception (score of less than 7) and good perception (score of 7+). A total perception score was also calculated, and ranged between 29 and 66. This was also dichotomized into poor perception (score less than 38) and good perception (score of 38+).

As shown in Table 10, the overall mean perception score differed significantly between adherent and non-adherent patients ( $p$ -value=0.011). Categorical analysis after dichotomizing the score to poor perception and good perception yielded similar results. Overall, those with good perception were 2.2 times more likely to adhere to anti-malarial treatment than those with poor perception (95% CI=1.1-4.9). After stratifying the results into perception subcategories, perception of susceptibility and perception of severity were not associated with adherence. However, those with good perception of benefits were 3.3 times more likely to adhere to treatment than those with poor perception of benefits (95% CI=1.6-6.7). Similarly, those with good perception of barriers were 1.91 times more likely to adhere to treatment than those with poor perception of barriers (95% CI=1.0-3.9).

**Table 9** Perception on malaria and drug adherence among vivax malaria patients, Mae Hong Son province, 2006.

Perception of malaria	Non adherence		Adherence		p-value
	N	%	N	%	
Total	157	100.0	49	100.0	
- Being infected with malaria is quite common.	54	34.4	19	38.8	0.785
- Everyone is at risk of getting malaria.	118	75.2	38	77.6	0.796
- Only weaker persons can get infected with malaria.	60	38.2	18	36.7	0.046
- Staying overnight in the forest puts one at increased risk for malaria.	131	83.4	44	89.8	0.524
- There is greater risky for malaria infection when traveling into the forest in the rainy season than at any other time.	122	77.7	41	83.7	0.616
- You should go to the malaria clinic immediately for a blood test if you feel ill.	140	89.2	47	95.9	0.258

**Table 9** Perception on malaria and drug adherence among vivax malaria patients, Mae Hong Son province, 2006 (cont.).

Perception of malaria	Non adherence		Adherence		p-value
	N	%	N	%	
- You should take time off from work to have your blood checked for malaria.	65	41.4	30	61.2	0.035
- Showing symptoms of headache, fever and weakness are to suspect that it is malaria.	118	75.2	46	93.9	0.007
- Malaria patients are unable to work while they are ill.	134	85.4	42	85.7	0.154
- You must complete all of the prescribed drugs to be cured of malaria.	143	91.1	47	95.9	0.320
- Death may occur if a person had inappropriate treatment for malaria.	126	80.3	38	77.6	0.356
- Malaria patients can be re-infected if you did not complete medication	111	70.7	38	77.6	0.497
- Sleeping under a mosquito net every night can prevent malaria infection.	128	81.5	41	83.7	0.367
- Insecticide spraying should be done only in a malaria patient's house.	89	56.7	22	44.9	0.002

**Table 10** Association between perception scores of malaria and drug adherence of vivax malaria patients, Mae Hong Son, 2006.

Perception of malaria	Non adherence		Adherence		OR	95%CI	p-value
	N	%	N	%			
Total	157	100.0	49	100.0			
Perceived susceptibility							
Poor (<10)	62	39.5	17	34.7	1.0		
Good (10-12)	95	60.5	32	65.3	1.2	0.6-2.6	0.546
Perceived severity of malaria							
Poor (<10)	69	43.9	19	38.8	1.0		
Good (10-12)	88	56.1	30	61.2	1.2	0.6-2.5	0.522
Perceived benefit of adherence to the anti-malarial medication							
Poor (<10)	119	75.8	24	49.0	1.0		
Good (10-12)	38	24.2	25	51.0	3.3	1.6-6.7	0.000

**Table 10** Association between perception scores of malaria and drug adherence of vivax malaria patients, Mae Hong Son, 2006 (cont.).

Perception of malaria	Non adherence		Adherence		OR	95%CI	p-value
	N	%	N	%			
Perceived barriers of adherence to anti-malarial medication							
Poor (<7)	86	54.8	19	38.8	1.0		
Good (7-9)	71	45.2	30	61.2	1.9	0.9-3.9	0.050
Total							
Poor (<38)	87	55.4	17	34.7	1.0		
Good (38-45)	70	44.6	32	65.3	2.3	1.1-4.9	0.011

The majority of both the adherent and non-adherent groups had no serious side effects to the anti-malarial treatments, with 71.4% of adherent and 62.4% of non-adherent not suffering side effects. More than 50 percent of the respondents who experienced side effects reported nausea, vomiting, and dizziness. As shown in Table 11, adherence to anti-malarial treatment was not significantly associated with side effects of anti-malarial treatments.

**Table 11** Frequency of side effects from antimalarial drugs among vivax malaria patients, Mae Hong Son province, 2006.

Side effects	Non adherence		Adherence		p-value
	N	%	N	%	
Total	157	100.0	49	100.0	
No	98	62.4	35	71.4	0.306
Yes	59	37.6	14	28.6	
Symptoms (Multiple answers)					
Nausea/vomiting/dizziness	84	53.5	31	63.1	0.252
Abdominal pain/diarrhea	3	1.9	1	2.0	1.000*
Change in color of urine	8	5.1	6	12.2	0.103*
Others	20	12.7	4	8.2	0.093*

\* Fisher's exact test

Table 12 describes access to information received on anti-malarial treatments by vivax malaria patients after visiting malaria clinics, stratified by type of adherence. We asked whether the patients could recall and explain the drugs received from the malaria officers. A higher proportion of adherent patients than non-adherent patients could recall taking chloroquine or primaquine in the last 14 days (75.5% for adherent, 55.4% for non-adherent,  $p$ -value=0.013), could recall the color of the pills (83.7% for adherent vs. 52.2% for non-adherent,  $p$ -value=0.000), and could clearly understand and recall the labels and instructions (81.6% for adherent vs. 57.3% for non-adherent,  $p$ -value=0.002). For other questions on access to information, the proportions were statistically similar. The access questions were summarized and scored, and further dichotomized to low access (score of less than 6) and high access (score of 6+). As shown in Table 13, further analysis of the summary data revealed that those with high access to information on antimalarial medication scores were 5.6 times more likely to adhere to treatment than those with low access scores (95%CI=2.0-18.9).

**Table 12** Access to information on antimalarial medication and drug adherence among the vivax malaria patients, Mae Hong Son Province, 2006.

Access to information on antimalarial medications	Non adherence		Adherence		p-value
	N	%	N	%	
Total	157	100.0	49	100.0	
- Recalled taking chloroquine and primaquine for full 14 days.	87	55.4	37	75.5	0.013
- Could recall color of anti-malarial pills correctly.	82	52.2	41	83.7	0.000
- Received drug package from malaria clinics correctly.	124	79.0	42	85.7	0.408
- Took the first dose of anti-malarial drug immediately after diagnosis.	122	77.7	38	77.6	1.000
- Clearly understood drug label and instructions.	90	57.3	40	81.6	0.002
- Malaria officer clearly explained how to complete anti-malarial treatment.	130	82.8	45	91.8	0.169
- Understood all of the details.	121	77.1	43	87.8	0.154
- Took drug after meal to decrease side effects of antimalarial treatment.	98	62.4	35	71.4	0.306

**Table 13** Summary of access to information on antimalarial medication scores and drug adherence among vivax malaria patients, Mae Hong Son, 2006.

Access to drug prescription	Non adherence		Adherence		OR	95%CI	p-value
	No.	%	No.	%			
Total	157	100.0	49	100.0			
Low (<6)	61	38.9	5	10.2	1.0		
High (6-8)	96	61.1	44	89.8	5.6	2.0-18.9	0.000
Mean	5.75		6.83				
S.D.	1.83		1.28				

In analyzing health care services received and anti-malarial treatment adherence (Table 14), there was only one item where the results differed by adherence. Among those who adhered to the treatment, 89.8% had their malaria officer explain the administration of the treatment while only 68.8% of the non-adherent group had a similar explanation from their malaria officer (p-value=0.003). However, after summarizing and dichotomizing the health care services received score in Table 15, there was no association between health care services received and anti-malarial treatment adherence.

**Table 14** Health care services among vivax malaria patients and adherence, Mae Hong Son Province, 2006.

Health care service items	Non adherence		Adherence		P-value
	N	%	N	%	
- You received enough health education on malaria while waiting for your blood test at the clinic.	55	35.0	20	40.8	0.499
- Malaria officer let you know of your blood results.	139	88.5	46	93.6	0.418
- Malaria officer explained the drug administration to you.	131	83.4	44	89.8	0.362
- Malaria officer told you about the side effects of anti-malarial drugs	108	68.8	44	89.8	0.003
- Malaria officer gave you advice on how to take care of yourself while taking anti-malarial drugs.	89	56.7	28	57.1	1.000

**Table 14** Health care services among vivax malaria patients and adherence, Mae Hong Son Province, 2006 (cont.).

Health care service items	Non adherence		Adherence		P-value
	N	%	N	%	
- Malaria officer provided materials on information about malaria.	16	10.2	6	12.2	0.791
- Materials used for instruction of treatment were up to date.	9	5.7	2	4.1	1.000
- Malaria officer made a follow-up appointment to you.	118	75.2	39	79.6	0.571

**Table 15** Association between health care service scores and drug adherence among vivax malaria patients, Mae Hong Son province, 2006.

Health care service scores	Non adherence		Adherence		OR	95%CI	p-value
	N	%	N	%			
Total	157	100.0	49	100.0			
Poor (<14)	73	46.5	18	36.7	1.0		
Good (14-24)	84	53.5	31	63.3	1.5	0.7-3.1	0.229
Mean		14.60		14.75			
SD		2.44		2.26			

In analyzing the individual questions items assessing social support among vivax malaria patients, only one of the individual items for health care services at the malaria clinics was associated with adherence to anti-malarial treatments (Table 16), nor was the summary score for social support after it was summarized and dichotomized (Table 17).

**Table 16** Social support among vivax malaria patients, Mae Hong Son Province, 2006.

Social support items	Non adherence		Adherence		p-value
	N	%	N	%	
- Family members helped at home and/or worked for you while you were ill.	79	50.3	26	53.1	0.747
- Family members encouraged you to follow the instructions and suggestions given to you by the malaria officers.	109	69.4	34	69.4	1.000
- Newspapers, radio, and television set provided you usefully an information on health promotion.	76	48.4	26	53.1	0.625
- You received good services from the malaria officers.	128	81.5	45	91.8	0.117
- Malaria officers advised you to take care of your health.	96	61.1	38	77.6	0.040
- You followed the suggestions on how to take anti-malarial drugs that the malaria officer gave you.	128	81.5	45	91.8	0.117
- Your neighbors reminded you to take anti-malarial drugs.	49	31.2	15	30.6	1.000
- Health volunteer encouraged you to take care of your health.	34	21.7	10	20.4	1.000

**Table 17** Association between social support scores and drug adherence of vivax malaria patients, Mae Hong Son, 2006.

Social support score	Non adherence		Adherence		OR	95%CI	p-value
	No.	%	No.	%			
Total	157	100.0	49	100.0			
Poor support (<18)	85	54.1	28	57.1	1.0		
Good support ( $\geq 18$ )	72	45.9	21	42.9	0.9	0.4-1.8	0.712
Mean	18.03		18.38				
S.D.	3.26		2.80				

Finally, a multivariate logistic regression model was analyzed to determine the social factors associated with adherence to anti-malarial treatments after adjusting for potential confounding factors. Only 3 predictors were included in the analysis model,

knowledge of malaria scores, perception of malaria scores, and access to information on anti-malarial medication scores (Table 18). Patient's adherence was significantly associated with the knowledge of malaria scores (aOR=2.2, 95%CI=1.1-4.4), and the access to drug taking scores (aOR=5.6, 95%CI=2.1-15.1).

**Table 18** Results of logistic regression analysis to identify determinants for knowledge of malaria, perception on malaria, access to information on antimalarial medication and drug adherence of vivax malaria patients.

Variables	Unadjusted		Adjusted	
	OR*	95%CI*	OR*	95%CI*
<b>Knowledge scores of malaria</b>				
Poor (<10 scores)	1.0		1.0	
Good (10-15 scores)	2.1	1.0-4.3	2.2	1.1-4.5
<b>Perception scores of malaria</b>				
Low (<38 scores)	1.0		1.0	
High (38-45 scores)	2.3	1.1-4.9	1.9	0.9-3.8
<b>Access to information on</b>				
<b>Anti-malarial medication scores</b>				
Poor (<6 scores)	1.0		1.0	
Good (6-8 scores)	5.6	2.0-18.9	5.6	2.1-15.3

\* OR = odds ratio; 95% CI = 95% confidence interval.

**Part II: Improvements in self-esteem, self-efficacy, health education skills, and job satisfaction in malaria health officers after attending the empowerment training program according to train the officers on the information, education, and communication (IEC) packages for vivax malaria patients.**

**2.1 General information of malaria officer:** The group of 17 was composed of the head of Vector Borne Disease Unit and his malaria officers. Most malaria officers were male (88.2%). The mean age of the 17 malaria officers was 40.9 years old, and 76.4% graduated from secondary school. The average years of experience in health education was 14 years. Languages spoken included Thai (100%), Thai and Karen (76.4%), Thai and Thai Yai (70.6%), Thai and Burmese (17.6%) (Table19).

**Table 19** Number and percentage of malaria officer in malaria clinics.

Variables	N	%
<b>Gender</b>		
Male	15	88.2
Female	2	11.8
<b>Age (years)</b>		
27-40	7	41.2
41-58	10	58.8
Min=27, Max=58, Mean= 40.9, S.D.= 9.4		
<b>Educational level</b>		
Primary school	2	11.8
Secondary school	13	76.4
Bachelor degree	2	11.8
<b>Experience in malaria health education (years)</b>		
5-10	6	35.3
10 and above	11	64.7
Min=5, Max=30, Mean=14 , S.D.=7.4		
<b>The ability of language spoken</b>		
Thai	17	100.0
Thai and Karen	13	76.4
Thai and Thai Yai	12	70.6
Thai and Burmese	3	17.7

**2.2 The change of behaviors of the malaria officers:** We tracked changes in four behavioral factors in the malaria officers during the study: self-esteem, self-efficacy, health education skills on the IEC process and structure, and satisfaction of performance. These four factors were measured three times: before the empowerment training program, before the implementation of IEC program, and 3-month after the implementation of the program.

The results from these three measurements show that the mean scores of all behaviors increased each time. Analysis revealed that the score for self-esteem had increased progressively between the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> measurement, with the average scores of 40.6, 42.8, and 43.2, respectively. The average score for self-efficacy and health education skills on both the process and the structure of IEC also increased. For overall satisfaction, the average scores increased from 58.2 to 64.8, and then to 66.8, as shown in Table 20.

**Table 20** Mean scores in behavioral changes of 17 malaria officers during the study.

Variables	1 <sup>st</sup> measurement				2 <sup>nd</sup> measurement				3 <sup>rd</sup> measurement			
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
Self-esteem	40.6	3.7	32	46	42.8	3.4	37	48	43.2	3.6	37	48
Process of IEC												
- Self-efficacy	19.9	3.4	15	24	21.9	2.9	16	24	22.3	1.8	19	24
- IEC skills	22.1	2.7	16	24	22.9	2.7	16	24	23.5	0.9	21	24
Structure of IEC												
- Self-efficacy	24.2	4.9	15	24	27.5	2.9	20	30	27.6	2.2	24	30
- IEC skills	27.6	3.3	19	30	28.5	3.3	20	30	29.3	1.3	26	30
Job satisfaction												
- Professional work environment	12.0	2.2	8	15	13.7	1.5	9	15	14.1	0.9	12	15
- Autonomy	10.6	1.5	8	15	11.2	1.3	8	12	11.8	0.4	11	12
- Work worth	10.8	1.4	8	12	11.7	0.9	8	12	11.9	0.3	11	12
- Within/between professional relationship	12.2	1.9	9	15	14.1	1.7	10	15	14.6	0.8	12	15
- Role enactment	12.6	2.3	10	15	14.1	1.5	10	15	14.4	0.9	12	15

### **2.3 Analysis of variance on the result of attending the empowerment training program on behavioral change in malaria officers:**

The four items of behavioral change scores (self-esteem, self-efficacy, health education service skill on the IEC process and structure, and job satisfaction) were analyzed using analysis of variance (ANOVA) to determine if the mean scores were significantly different between the three time periods that they were measured: before the empowerment training program, before implementation of the IEC program, and after implementation of the IEC program for three months. As shown in Table 21, there was a significant difference in mean scores in at least two of the three time periods for every behavior measured, except for the score for self-esteem and IEC service skill for both the IEC process and IEC structure.

**Table 21** Comparison mean of the results of the empowerment training program (ETP) on behavioral change of 17 malaria officers.

Variables	Mean	S.D.	F	p-value
<b>Self-esteem</b>				
Pretest	13.5	1.2	2.649	0.081
Posttest 1	14.5	1.1		
Posttest 2	14.4	1.2		
<b>IEC Process</b>				
- Self-efficacy				
Pretest	19.9 <sup>b</sup>	3.4	3.519	0.038
Posttest 1	21.9	2.9		
Posttest 2	22.3 <sup>b</sup>	1.8		
- IEC service skill				
Pretest	22.1	2.7	1.781	0.179
Posttest 1	22.9	2.7		
Posttest 2	23.5	0.9		
<b>IEC structure</b>				
- Self-efficacy				
Pretest	24.2 <sup>a,b</sup>	4.9	5.173	0.009
Posttest 1	27.5 <sup>a</sup>	2.9		
Posttest 2	27.6 <sup>b</sup>	2.2		
- IEC service skill				
Pretest	27.6	3.3	1.473	0.239
Posttest 1	28.5	3.3		
Posttest 2	29.3	1.3		
Total job satisfaction				
Pretest	58.2 <sup>a,b</sup>	7.5	10.478	0.000
Posttest 1	64.8 <sup>a</sup>	6.1		
Posttest 2	66.8 <sup>b</sup>	2.1		

**Table 21** Comparison mean of the results of the empowerment training program (ETP) on behavioral change of 17 malaria officers (cont.).

Variables	Mean	S.D.	F	p-value
- Professional work environment				
Pretest	12.0 <sup>a, b</sup>	2.2	8.210	0.001
Posttest 1	13.7 <sup>a</sup>	1.5		
Posttest 2	14.1 <sup>b</sup>	0.9		
- Autonomy				
Pretest	10.6 <sup>b</sup>	1.5	3.985	0.025
Posttest 1	11.2	1.3		
Posttest 2	11.8 <sup>b</sup>	0.4		
- Work worth				
Pretest	10.8 <sup>a, b</sup>	1.4	5.277	0.008
Posttest 1	11.7 <sup>a</sup>	0.9		
Posttest 2	11.9 <sup>b</sup>	0.3		
- Within/ between professional relation				
Pretest	12.2 <sup>a, b</sup>	1.9	11.462	0.000
Posttest 1	14.1 <sup>a</sup>	1.7		
Posttest 2	14.6 <sup>b</sup>	0.8		
- Role enactment				
Pretest	12.6 <sup>a, b</sup>	2.3	5.819	0.005
Posttest 1	14.1 <sup>a</sup>	1.5		
Posttest 2	14.4 <sup>b</sup>	0.9		

\* *The mean difference in each pair*

$$a = 1^{st} \& 2^{nd}, \quad b = 1^{st} \& 3^{rd}, \quad c = 2^{nd} \& 3^{rd}$$

### **Part III: Qualitative data about information education and communication (IEC) program among malaria health officers in the intervention setting.**

A comprehensive meeting to wrap up the IEC program among the seventeen malaria officers in Muang district was held in June 2007. The objective of this meeting was to summarize the results of the IEC program for the vivax malaria patients in the nine

malaria clinics. The presentation was made on the concept of the IEC process which included the goal, objectives, activities, problems, obstacles, messages on the IEC materials, channels, outcome of patient behaviors and ideas for the development of sustainable health education programs in the malaria clinics.

One of the malaria officers mentioned that *“In our responsibility areas have a variety of ethnic groups and languages that make communication to be difficult. It is very good for us to have various kinds of IEC materials to teach vivax malaria patients so that they take anti-malarial drugs correctly.”*

Another officer stated that *“Patients are also not eager to learn, sometimes they could not understand how to take medicines when they were sick, and after they went back home they could not remember which medicine should be started taking first and after and when.”*

One of the malaria officers said *“These IEC materials are helpful for me to explain to vivax malaria patients how to take antimalarial drugs. I especially like to have the new bags containing medicines and to have different bags for three different age groups. Each bag has diagrams showing directions on how to take antimalarial drugs and to remind them how to take medicines at a meal, how many tablets per dose, per day and to remind them the date of blood check up after completion within 14 days.”*

A malaria officer stated, *“Not only did the malaria patients receive the IEC program, so did their relatives. They were also interested and participated in the IEC messages by sharing from their experiences. It could be worth to include IEC into this program so that they can learn how to protect themselves from mosquito bites. Also, their relatives can remind the patients to take medicines on time and to remind them the date of follow up for blood check.”*

Another malaria officer expressed *“For me, I really like the flip chart that gives information on knowledge of malaria, signs and symptoms, and diagnosis method. It encourages the patients to take anti-malarial drugs by following the direction of treatment, it lets them know side effects during treatment and how to alleviate side effect if they occur. This flipchart also repeats the follow up date for blood check, and also emphasizes prevention and control of malaria in their family. I observed that the patients and their relatives were interested and participated in the program very well when I taught them. After that I let them copy my words how to take the antimalarial medicines. They could*

*repeat that correctly. I think that the patients would take the medicine after the instructions and come back on time to check their blood.”*

*A malaria officer said “I teach patients face to face and always recommend them to read the instruction page for antimalarial treatment, which it is printed on the pamphlet in three different languages. Some patients could read all local languages that includes Thai Yai and Karen, however most of the patients were able to read Thai. On the other hand, some patients could not some alphabets, so we explained by using pictures on the pamphlet. After that, I confirmed what they learned the by asking them to copy me how to take antimalarial drugs. They repeated very well my instruction in taking medicines.”*

*A malaria officer said “This was the first opportunity for us to be in the research project and to participate in producing IEC materials for patients that based on our and the patient’s needs. We never did this before, but now we know the way and we think we can transfer the knowledge of the IEC program to other malaria clinics in Mae Hong Son province.”*

*One of the malaria officer said “We really enjoyed helping each other organize special areas to encourage health education on malaria for patients and their relatives. A health information corner is established in our malaria clinic which displays the posters, pamphlets, and flipcharts. It is an interesting area for patients. The patients got many benefits in joining the IEC program. They can ask many questions directly to us and we learn more from those questions.”*

*The head of a malaria clinic explained that “Every malaria clinic in Mae Hong Son province should do the IEC program for their malaria patients, not only for vivax malaria, but should also for falciparum malaria as well. If problems and obstacles occur during implementation, they can bring these issues to discuss together in the monthly meeting at the Vector Borne Disease Center.”*

*The head of the Vector Borne Disease Center agreed that “This project could re-organize all malaria clinics in Mae Hong Son province but it will be expensive to produce the IEC materials and to train the staff. Therefore, we require support from the Office of Disease Prevention and Control No.10 to allocate budget for these activities. For now, we can sustain the program by using the IEC materials produced from this project.”*

*In summary, the process of implementing the IEC program to improve drug taking behavior among vivax malaria patients in the malaria clinics utilized an empowerment*

program with emphasis on the participatory learning process. It composed of six stages as follow: base line data collecting in preliminary study, empowerment programming for the malaria health officers for planning the IEC program in the malaria clinic, developing of user friendly tailored IEC materials, pre testing IEC materials and guidelines, revising the IEC materials, finalizing the prototype of the IEC materials, and training personnel to implement the IEC program in malaria clinics. The IEC materials produced through the empowerment program included posters, flipcharts, pamphlets, and newly designed drug bags for vivax malaria patients in the intervention malaria clinics in Muang district, Mae Hong Son province. As the interviews demonstrate, the process was well accepted by the malaria officers, who showed great enthusiasm for the program. They found the IEC materials and the process were helpful in educating their patients on malaria and malaria treatment. It greatly helped the officers to involve from the onset of the program, to develop the process and materials, to the training, to the final implementation, and to the final debrief.

**Part IV: Changes in behavior in vivax malaria patient regarding knowledge of malaria, perception, self-efficacy, service satisfaction, and adherence to anti-malarial drug prescription.**

The second phase of study was conducted in twelve malaria clinics, of which nine malaria clinics (Pha Bong, Pang Mu, Pa Lan, Huai Sua Tou, Huai Pong, Mai Sa Pei, Mai Dua Ghom, Muang, and Ban Klang in Muang district) were designated as the intervention clinics while the other three malaria clinics (Mae Sa Riang, Ban Gard, and Tha Ta Phang in Mae Sa Riang district) were designated as control clinics. Participants of 142 patients in the intervention group and 117 in the control group (Table 22) were recruited from vivax patients who visited the clinics between March and September 2007.

**Table 22** Number of study patients participating in each malaria clinic in Muang, and Mae Sa Rieng Districts, Mae Hong Son Province, 2007.

Malaria clinic study sites	Study settings							
	Intervention group (Muang district)				Control group (Mae Sa Rieng district)			
	Pretest		Posttest		Pretest		Posttest	
	N	%	N	%	N	%	N	%
<b>Muang District</b>								
• Pha Bong	67	47.2	62	43.7	-	-	-	-
• Pang Mu	32	22.5	32	22.5	-	-	-	-
• Pa Lan	13	9.2	13	9.2	-	-	-	-
• Huai Sua Tou	8	5.6	8	5.6	-	-	-	-
• Huai Pong	7	4.9	7	4.9	-	-	-	-
• Mai Sa Pei	6	4.2	6	4.2	-	-	-	-
• Mai Dua Ghom	4	2.8	4	2.8	-	-	-	-
• Muang	4	2.8	4	2.8	-	-	-	-
• Ban Klang	1	0.7	1	0.7	-	-	-	-
<b>Mae Sa Rieng District</b>								
• Mae Sa Rieng	-	-	-	-	86	73.5	83	70.9
• Ban Gard	-	-	-	-	22	18.8	15	12.8
• Tha Ta Phang	-	-	-	-	9	7.7	9	7.7
Total	142	100.0	137	96.5	117	100.00	107	91.5

### 3.1 General demographic characteristics of the intervention and control groups.

General demographic data of the study samples are presented and compared in Table 23. The sample is comprised of 142 (54.8%) vivax malaria patients in the intervention clinics and 117 (43.2%) vivax malaria patients in control clinics. Most respondents were the patients themselves, with 128 in the intervention group (90.1%) and 102 in the control group (87.2%), while the remaining respondents were parents or caretakers for the patients. A majority of the respondents were male, with 69.7% in the intervention and 84.6% in the control group. About 46% of the both groups were older than 30 years old. Over 53% of respondents in the intervention group were not married (single, separate or divorced) and so were 42% in the control group. More than 50% of the respondents in both groups were Thai Yai, Karen, and Burmese, and a similar proportion finished at least primary school (grade 6). About 35% were employees with monthly wages less than 2,000 Baht. The mean number of family members in both the groups was four persons. Around 80% of the subjects in the intervention and control groups did not have

vivax malaria in the past year. When the intervention and control groups were compared on demographic variables using Pearson's  $\chi^2$  test, the control group had a higher proportion of males than the intervention group ( $p=0.005$ ) and control group generally earned more income ( $p=0.013$ ). No other demographic variable was significantly different between the intervention and control groups.

**Table 23** Demographics of the study population by intervention and control group.

Demographic variables	Intervention group (n=142)		Control group (n=117)		$\chi^2$	df	p-value
	n	%	n	%			
Respondents							
Patients	128	90.1	102	87.2	0.566	1	0.452
Parents/others	14	9.9	15	12.8			
Gender							
Male	99	69.7	99	84.6	7.906	1	0.005
Female	43	30.3	18	15.4			
Age (year)							
$\leq 15$	32	22.5	23	19.7	0.320	2	0.852
16-30	46	32.4	39	33.3			
$> 30$	64	45.1	55	47.0			
Marital status							
Single/Separated/ Divorced	76	53.5	49	41.9	3.481	1	0.062
Married	66	46.5	68	58.1			
Nationality							
Thai	60	42.3	55	47.0	0.588	1	0.443
Others*	82	57.7	62	53.0			
Educational level							
No schooling	45	31.7	24	20.5	4.832	2	0.089
Primary school (Grade 6)	55	38.7	47	40.2			
Higher than primary school	42	29.6	46	39.3			
Main occupation							
Unemployed**	43	30.3	31	26.5	5.338	3	0.149
Employee	52	36.6	39	33.3			
Farmer	36	25.4	27	23.1			
Others	11	7.7	20	17.1			
Monthly income (Baht)							
$< 2,000$	85	59.9	58	49.5	8.718	2	0.013
2,001-4,000	37	26.1	25	21.4			
$> 4,000$	20	14.1	34	29.1			
Number of household family (person)							
1-3	52	36.6	32	27.4	2.568	2	0.277
4-6	74	52.1	71	60.7			
$> 6$	16	11.3	14	12.0			

**Table 23** Demographics of the study population by intervention and control group (cont.).

Demographic variables	Intervention group (n=142)		Control group (n=117)		$\chi^2$	df	p-value
	n	%	n	%			
Having vivax malaria in the past year							
Do not remember	8	5.6	10	8.5	0.872	2	0.647
No	118	83.4	95	81.2			
Yes	16	11.3	12	10.3			

\* includes Thai Yai, Karen, and Burmese, \*\* includes students and housewives

After receiving the IEC program from the malaria clinics, the study subjects were asked whether they knew the type of malaria. As shown in Table 24, 84.5% of the intervention group and 75.2% of the control groups knew the type of malaria that infected them. During malaria treatment, more than 80% of both groups had family to take care of them and to remind them to take anti-malarial drugs.

**Table 24** Frequency among study subjects receiving information on the type of malaria subjects are infected with and getting reminders from family to take antimalarial drugs by study group.

Variables	Intervention group (n=142)		Control group (n=117)		$\chi^2$	df	p-value
	n	%	n	%			
Received information about the type of malaria subject is infected with							
Do not remember	22	15.5	29	24.8	3.503	1	0.061
Yes	120	84.5	88	75.2			
Having family to care for the subject and remind them to take anti-malarial drugs							
No	17	12.0	16	13.7	0.167	1	0.682
Yes	125	88.0	101	86.3			

### **3.2 Knowledge and perception of malaria treatment, self-efficacy to perform drug adherence to anti-malarial drug treatment and adherence to anti-malarial drug prescription mean scores by study group.**

#### **3.2.1 Comparison of study groups on knowledge of malaria, perception of malaria treatment and self-efficacy to perform drug adherence.**

**3.2.1.1 Knowledge of malaria:** There were 15 questions that assessed knowledge of malaria, with scores ranging from 1 to 15. The scores were categorized into three levels: low, moderate, and high level of knowledge. Before implementation of the IEC program, about 50% of both the intervention and control groups were in the low and moderate levels of knowledge scores, and around 15% was in the high level. After the implementation, the proportion of subjects in the intervention group who had a high level of malaria knowledge increased from 14.1% to 52.6%. In the control group, the proportions remained almost the same (Table 25).

**3.2.1.2 Perception of malaria treatment:** There were 10 items that assessed perception of malaria treatment and the possible range of perception scores was between 10 and 30. The scores were then categorized into three levels: low, moderate, and high. Before implementation of the IEC program, a majority of the intervention (66.2%) and control (59.0%) groups had moderate levels of perception. Less than 10% of both the groups had low levels of perception. After the implementation, about half of the intervention group moved from the moderate and low levels of perception to the high level. The level of perception among the control group did not change significantly (Table 25).

**3.2.1.3 Self-efficacy to adhere to anti-malarial drug treatment:** There were 15 items to assess self-efficacy to adhere to anti-malarial treatments and the possible range of the self-efficacy scores was 15-45. This data was collected only after the implementation in order to avoid leading questions and information bias. About 86.1% of the intervention group was in the high level of self-efficacy while around 70% of the control group was in the moderate and low level (Table 26).

**3.2.1.4 Service satisfaction:** There were 27 items that measured service satisfaction and the possible range of scores was 27-81. The scores were categorized into three levels: low, moderate, and high. Similar to the questions measuring self-efficacy, we collected the data only after the implementation. As shown in Table 26, 92.4% of the intervention group had a high level of satisfaction to health care services in

the malaria clinics, while 63.6% of the control group had a moderate level of service satisfaction (Table 26).

**Table 25** Knowledge and perception of malaria scores before and after the intervention between intervention and control groups.

Level of knowledge and perception on malaria,	Intervention group				Control group			
	Before (n=142)		After (n=137)		Before (n= 117)		After (n= 107)	
	n	%	n	%	n	%	n	%
<b>Knowledge of malaria</b>								
Low	43	30.3	11	8.0	28	23.9	22	20.6
Moderate	79	55.6	54	39.4	68	58.1	68	63.6
High	20	14.1	72	52.6	21	17.9	17	15.9
Mean score	9.8		12.3		10.0		10.2	
S.D.	2.3		1.9		2.6		2.1	
<b>Perception of malaria</b>								
Low	12	8.5	9	6.6	8	6.8	10	9.3
Moderate	94	66.2	46	33.6	69	59.0	54	50.5
High	36	25.4	82	59.9	40	34.2	43	40.2
Mean score	22.7		25.3		23.3		23.7	
S.D.	2.7		3.1		2.5		2.9	

**Table 26** Self-efficacy to adhere to antimalarial drug treatment score and service satisfaction score after the intervention between intervention and control groups.

Level of self-efficacy and service satisfaction	Intervention Group (n=137)		Control Group (n= 107)	
	n	%	n	%
	<b>Self-efficacy to perform drug adherence to anti-malarial drug treatment</b>			
Low	-	-	8	7.5
Moderate	19	13.9	78	72.9
High	118	86.1	21	19.6
Mean score	40.5		33.2	
S.D.	2.7		3.7	
<b>Service satisfaction</b>				
Low	-	-	3	2.8
Moderate	8	5.8	68	63.6
High	129	94.2	36	33.6
Mean score	76.9		63.6	
S.D.	4.6		5.6	

### 3.3 Comparisons of mean scores for knowledge and perception of malaria between the intervention and control groups before and after the intervention.

#### 3.3.1 Comparison of the mean scores for knowledge of malaria

Before the implementation, the intervention group had a knowledge mean scores of 9.77 (S.D.=2.3) while the control group had a higher score of 10.0 (S.D.=2.5). The knowledge mean score was not statistically significant different (p-value=0.425) before the implementation when tested with the Student's t-test. After implementation, the mean score for the intervention group increased to 12.3 (S.D.=1.9). The mean score for the control group increased slightly from 10.0 to 10.2 (S.D.=2.1). The mean score for the intervention group was significantly higher than the score of the control group (p-value=0.000) (Table 27).

#### 3.3.2 Comparison of the mean scores for perception of malaria

Before implementation, the intervention and control groups had perception mean scores equal to 22.7 (S.D.=2.7) and 23.3 (S.D.=2.5), respectively. The perception mean scores were not significantly different (p-value=0.063). After implementation, the perception mean scores for the intervention group increased to 25.3 (S.D.=3.1). The mean score for the intervention group was significantly higher than that of the control group (p-value<0.001) (Table 27).

**Table 27** Comparison of knowledge and perception of malaria mean scores between intervention and control groups, before and after intervention.

Variables	Intervention group		Control group		t	df	p-value
	Mean	S.D.	Mean	S.D.			
<b>Knowledge of malaria</b>							
Before intervention	9.8	2.3	10.0	2.6	0.799	257	0.425
After intervention	12.3	1.9	10.2	2.1	8.205	242	0.000
<b>Perception of malaria</b>							
Before intervention	22.7	2.7	23.3	2.5	1.866	257	0.063
After intervention	25.3	3.1	23.7	2.9	4.074	242	0.000

### **3.4 Comparison of self-efficacy to adhere to anti-malarial drug treatment, adherence to anti-malarial drug treatment and service satisfaction mean scores between the intervention and control group after intervention.**

#### **3.4.1 Comparison of self-efficacy to adhere to anti-malarial drug treatment mean scores.**

After implementation, the self-efficacy means score of the intervention group (40.5) was significantly higher than that of the control group (33.2) (p-value<0.001) (Table 28).

#### **3.4.2 Comparison of access to information on anti-malarial medications**

After the implementation, the adherence to antimalarial drug treatment mean scores was 9.7 in the intervention group, which was significantly higher than of the score of 7.3 in the control group (p-value<0.001) (Table 28).

#### **3.4.3 Comparison of service satisfaction**

After the implementation, the service satisfaction mean score of 76.9 in the intervention group was significantly higher than of the mean score of 63.6 in the control group (p-value<0.001) (Table 28).

**Table 28** Comparison of self-efficacy to adhere to anti-malarial drug treatment, access to information on antimalarial medications and service satisfaction mean scores between the intervention and control group after the program.

Variables	Intervention group		Control group		t	df	p-value
	Mean	S.D.	Mean	S.D.			
After the intervention							
Self-efficacy to adhere to anti-malarial drug treatment	40.5	2.7	33.2	3.7	17.876	242	0.000
Access to information on antimalarial medication	9.7	1.3	7.3	1.6	12.951	242	0.000
Service satisfaction	76.9	4.6	63.6	5.6	20.273	242	0.000

### 3.5 Comparison of knowledge and perception of malaria mean scores of the study groups before and after intervention.

#### 3.5.1 Comparison of knowledge and perception of malaria mean scores in the intervention group before and after intervention.

After the implementation of the IEC program, the mean scores of knowledge and perception of malaria improved significantly in the intervention group (p-value<0.001) (Table 29).

#### 3.5.2 Comparison of knowledge and perception of malaria mean scores in the control group before and after intervention.

When the knowledge and perception of malaria mean scores of the control group were compared by paired t-test before and after the implementation, there was no significant difference between the two scores (Table 29).

**Table 29** Comparisons of knowledge and perception of malaria mean scores before and after intervention.

Variables	Before*		After*		t	df	p-value
	intervention		intervention				
	Mean	S.D.	Mean	S.D.			
Knowledge of malaria							
Intervention group	9.8	2.30	12.3	1.7	9.422	136	0.000
Control group	9.9	2.41	10.2	2.1	1.423	106	0.158
Perception of malaria							
Intervention group	22.6	2.64	25.3	3.1	7.984	136	0.000
Control group	23.2	2.45	23.7	2.9	1.401	106	0.164

\* Includes only the patients who had both pretest and posttest

### 3.6 Comparison of adherence to anti-malarial treatment and follow-up appointment dates between the intervention and control groups after implementation.

After returning to the clinics, 71.1% of the patients in the intervention group completed their prescribed anti-malarial treatments (chloroquine 2500 mg taken for three days and primaquine 15 mg per day for fourteen days). Furthermore, 6.3% did not adhere

to the treatment, 19.0% could not recall if they completed the treatment, and 3.6% did not come to the clinic for the follow-up appointment. In the control group, 29.9% of the patients adhered to the treatment while 28.2% did not, 33.3% could not recall, and 8.6% did not revisit the clinics (Table 30).

We also investigated whether patients followed instructions to return to the malaria clinics for follow-up appointments. As shown in Table 30, 80.3% of the patients in the intervention group adhered to their appointment date, 16.2% postponed their appointment to another date/time, and 3.5% did not appear for their follow-up appointment. In the control group, 63.2% of the patients adhered to their appointment date, while 28.2% postponed their appointment and 8.6% did not appear for their appointment (Table 30).

**Table 30** Adherence to antimalarial medications and follow-up schedule between the intervention and the control groups.

Adherence	Intervention group		Control group		$\chi^2$	df	p-value
	n	%	n	%			
Taking Chloroquine 2500 mg for three days and primaquine 15 mg per day for fourteen days							
- Adherent	101	71.1	35	29.9	47.62	3	0.000
- Non-adherent	9	6.3	33	28.2			
- Can not recall	27	19.0	39	33.3			
- Not revisit	5	3.6	10	8.6			
Adhere to follow up appointment							
- Adherent to appointment date	114	80.3	74	63.2	9.640	2	0.008
- Postponed to another date/time	23	16.2	33	28.2			
- Did not come in on appointment date	5	3.5	10	8.6			

### 3.7 Satisfaction of the vivax malaria patients toward the IEC materials.

After implementation of the IEC program, the vivax malaria patients in the intervention group were interviewed to determine whether they received their IEC materials. As described in Table 31, 86.1% received posters, 88.3% received pamphlets, 89.8% received flip charts, and 97.1% received newly drug bags. Most of the patients were

satisfied with the IEC materials; 97.8% were satisfied with the newly drug bag, 97.8% were satisfied with the flip chart, 81.7% were satisfied with the poster and 71.5% were satisfied with the pamphlet.

**Table 31** IEC materials received by the vivax malaria patients in the intervention group.

Type of IEC materials	Intervention group	
	n	%
Poster		
- Yes	118	86.1
- No	19	13.9
Pamphlet		
- Yes	121	88.3
- No	16	11.7
Flipchart		
- Yes	123	89.8
- No	14	10.2
Newly drug bag illustrating directions for drug prescription		
- Yes	133	97.1
- No	4	2.9
Overall satisfaction of IEC materials (Multiple answers)		
- Poster	112	81.7
- Pamphlet	98	71.5
- Flipchart	115	83.9
- Newly drug bag showing direction of drug prescription	134	97.8

**Part V: Qualitative data on the drug taking behavior of vivax malaria patients after receiving the IEC program:** the followings are quotations from the patients during focus group discussion:

**Tailored and user-friendly IEC materials for IEC program.**

*“Compared to the previous time that I came to this malaria clinic, there were various kinds of materials provided this time. It is good for the patients to understand how*

*to take medicine when they go back home. I think all of them are able to understand the materials easily even when some could not read, especially the newly drug bag showing pictures of medicine and the way to take it with each meal.”*

*“I really understand well the flipchart that the malaria officer showed me after finding out my blood results. It provides information on malaria, malaria prevention and malaria control, as well as malaria treatment that helped me understand how malaria parasites can be eliminated by taking anti-malarial drugs on time everyday until it is finished in 14 days. I came back to check my blood again at the follow-up appointment. Luckily, I had no more malaria parasites.”*

*“This is the second time I got vivax malaria. I remembered that I did not receive health education like I did now. It would be very good for me to have a chance learn more about malaria. I am very appreciated with this program.”*

#### **Drug taking behaviors and side effects of antimalarial drugs**

*“Sometimes I forgot to take anti-malarial drugs in the morning so I took it immediately when I remembered.”*

*“When I took the white colored tablets during the first three days, I felt nausea and vomited but the malaria officer told me that I should take them after a meal and rest as much as I can. After three days I felt better, and I did not have side effect anymore.”*

*“I didn’t have nausea and vomiting but I my urine turned darkish yellow when I took the drugs. I think that it might have happened because of the antimalarial treatment.”*

#### **Patients who rescheduled their follow-up appointment for another date/time**

*“I tried keeping the appointment date to check my blood but I forgot and after I remembered, I went immediately to the malaria clinic.”*

*“Important things came up, I had to go to the fields to search for food, so I postponed the follow-up appointment for another time. After I checked my blood, I didn’t have malaria anymore. Now, I feel better.”*

*“I received an appointment card from the malaria office after I went back home. I told my daughter to remind me of the follow-up date. I not only had the appointment card, but I also had the follow-up date on my medicine bag to remind me to go back to the clinic to check my blood.”*

## CHAPTER V

### DISCUSSION

This chapter is a discussion of the results of this study according to research objectives as follow:

**Objective one:** To investigate determinants that influence adherence to treatment among vivax malaria patients who received treatment at malaria clinics.

This objective was to determine behavioral factors associated with adherence to the standard course of chloroquine (25 mg base/kg for 3 days) and primaquine (0.25 mg/kg daily for 14 days) prescribed by malaria clinics for vivax malaria patients. This was a retrospective study of 206 vivax malaria patients living in Muang and Mae Sa Rieng Districts, Mae Hong Son Province between May and September, 2006. As shown in Table 6, 76.21% of vivax malaria patients did not intend to complete the medication course. The patient's adherence to treatment was associated with knowledge scores of malaria (aOR=2.22, 95%CI=1.10-4.45) and access to information on antimalarial medication scores (aOR=5.58, 95%CI=2.06-15.14). Although adherence was self-reported by study participants, we used assessment methods that were standardized, validated and well accepted in the adherence literature (Bosworth, 2006). Non-adherence to anti-malaria medication may not only be dangerous for the patient's health, but may also dramatically increase the financial cost for public health services (Sattabongkot, 2004).

In our study, some demographic factors were associated with adherence. Our findings suggested that those in forest-related occupations, such as farmers, were more likely to adhere than those in non-forest related occupations ( $p=0.056$ ). Our focus group discussions may suggest reasons why this may be. Many patients who worked in non-forest related occupations indicated that because they worked in or near areas with high malaria transmission, the best way to avoid malaria and continue working was to complete the malaria medications as directed. This was particularly true among the rural poor, since the family economy is usually the only source of income. However, the level

of schooling, gender and age did not significantly influence adherence to the prescribed anti-malarial drugs, which is similar to results reported by Simsek (2005).

This study also suggested that the general knowledge of malaria was associated with drug adherence. Symptoms commonly related to malaria are headache, shivering, and fever, specifically recurrent fevers. Both the adherent and non-adherent participants were equally knowledgeable about the signs and symptoms of malaria. Indeed, prior studies showed that populations living in malarious areas were generally knowledgeable about the signs and symptoms of malaria. In Guatemala and Turkey, more than 80% of the study populations recognized the symptoms of malaria (Klein, 1995, Simsek, 2005). Outside of the signs and symptoms of malaria, however, there was a fair amount of misinformation in malaria etiology. For example, a significant number of respondents reported that one could contract malaria by drinking untreated water. Only 50% of the adherent group knew the breeding sites for malaria vectors and protective measures against malaria. However, those who were adherent to vivax malaria medication were significantly more knowledgeable in malaria etiology than those who were non-adherent. This suggests that increasing general knowledge of malaria and of malaria etiology among patients may increase adherence to malaria treatment.

Perceived benefits and barriers were related to the beliefs of how treatment received at malaria clinics would affect the well being of an individual (Table 9). More than 80% of the patients in adherence and non adherence groups answered that they went to malaria clinics for medical attention when ill. They knew that the clinics provided free services, so that this was the first choice among villagers and therefore they knew where the clinic was located. Almost all malaria clinics were accessible by well-paved roads. In terms of the Health Belief Model (Rosenstock, 1988), cues to action were the factors that might encourage an individual to act in the face of their perception of severity of vivax malaria. In our study, adherence was significantly associated with perceived benefit and perceived barrier scores. This might provide a further path of action to encourage drug adherence behavior among vivax malaria patients.

Further qualitative data on drug-taking behaviors among vivax malaria patients was gathered from focus group discussions. We asked whether the patients could describe the anti-malaria treatment and what information they received from malaria officers. The adherent group could recall the number of days to complete taking chloroquine and

primaquine better than those in the non-adherent group. In northern Thailand, when medication is administered to patients at malaria clinics, verbal instructions are given, and instructions are written by hand on the 4 – 5 plastic bags that contain the drugs. These bags divide the medication according to the corresponding meals that the medication should be taken with. A limitation was that the plastic bags used to contain the medication were of poor quality, being easy to tear and difficult to close (Figure 8).



**Figure 8** Plastic bags used for dispensing malaria medications

Patients complained that the bags were not durable enough to last for 14 days. Furthermore, the study found that Information, Education and Communication (IEC) materials were not available at the malaria clinics. Low adherence rates indicated that the instructions provided to the patients were too complicated for the patients to understand, and the language used was a barrier for some patients, particularly ethnic minority groups. Even among patients who spoke Thai, literacy may have been an issue, similar to other studies that reported difficulties due to limited literacy among patients and their inability to read the written instructions (Ansah, 2001; Okonkwo, 2001). Furthermore, the qualitative data from our focus group interviews suggests that patients were not able to understand or remember the instructions and suggestions from the malaria officers because they were so ill when they received medication, regardless literacy or languages used. Therefore, the next step is to look for different models of IEC programs to be given for these target groups.

From interviews with the subjects, we found that 55.8% of the vivax malaria patients were satisfied with the health care services received from the malaria clinics. Critical to the patient adherence is good communication between the malaria officers and

the patients. Healthcare providers play a unique and important role in assisting patients' healthy behavior changes (Patel, 2005; Osterberg, 2005; Haynes, 2006). Studies have suggested that the healthcare provider's role can go beyond case investigations and prompt treatment. The healthcare provider can ensure that their patients are receiving the drug regimen to treat malaria and interventions that aid people in taking the correct treatment, thus maximizing their effectiveness.

This part of the study had both limitations and strengths. One strength is that this is the only study to date on how social factors may be associated with vivax malaria treatment adherence. This study also included a sufficiently large number of minority subjects. Furthermore, both the qualitative and quantitative data were collected. However, because the study was retrospective, and the participants were asked to recall actions that occurred during the past year, recall bias is a potential issue. Those who did not adhere to the treatments were more likely to incorrectly recall their treatments. Also, those who did not adhere to the treatment may have been less likely to participate, so there is potential for some participation bias.

In summary, this study found some evidence that suggests patients' knowledge of and access to information regarding the disease and its treatments were associated with adherence. The demographics factors such as age, gender, education, and occupation had no measurable impact on adherence levels. What was data suggests was that the manner and method of delivering malaria information and treatments was associated with adherence. Not utilizing the patient's native language, not keeping instructions simple, and not ensuring that the patients understood the instructions were major practices associated with non-adherence. The lack of standardized procedures for information delivery and for ensuring that patients understood the treatment regimen were issues cited by patients as causes for non-adherence. Therefore, the malaria officers were the significant person to provide the knowledge of malaria and malaria treatment for the vivax malaria patients by using the IEC program in their clinics.

**Objective two:** To design and develop IEC materials and easy-to-follow drug packages for chloroquine and primaquine tablets.

For this objective, we organized an Empowerment Training Program for the 17 malaria officers who were in charge of nine malaria clinics in the intervention area. The first workshop was to design and to develop prototypes of IEC drug materials that

addressed issues found in the study's first objective, specifically better quality materials and more user friendly language and verbiage that would be more appropriate for these patients. The workshops also trained malaria officers on strategies for increasing adherence to anti-malarial treatments. It emphasized participatory learning, starting with brainstorming, progressing to role-play, small group discussion and class exercises. The contents of the training consisted of knowledge of malaria, diagnosis and treatment for vivax malaria according to different age groups, and the prevention and control of malaria. Some of the skills developed during this program were team building, leadership skills, problem solving, identification of possible IEC materials, health education service skills, and basic communication skills. Other skills developed included planning, monitoring, and evaluation of malaria treatments and drug adherence among the vivax malaria patients.

The program emphasized participatory learning and team-building. The participants learned from each other by exchanging opinions and experiences from their tasks in all training activities. The meetings were informal between the malaria officers and the researcher. The participants shared their experiences in implementing the IEC program at their malaria clinics. Similar to the literature, we discovered that empowering providers and program administrators who identified and solved problems may be an effective means of sustaining quality and assuring continuous improvements (Jonas E, 2000).

To assess the impact of the training program on malaria officers, we compared the attitudes and perceptions of the malaria officers before and after the program. We found that the malaria officers had significantly increased self-esteem, self-efficacy and ability to implement the IEC program to vivax malaria patients after the program (Table 20). We collected data on the malaria officers three times; before the empowerment program, before using the IEC program and after the implementation of the IEC program. The results showed that the mean scores of perceived self-efficacy on the IEC process and perceived IEC structure were significantly increased (p-values = 0.038 and 0.009, respectively). This suggests that the empowerment program increased the sense of pride and accomplishment in their jobs, which corresponds to the principles developed by Bandura (1997). Bandura suggested that the primary source of an individual's self-efficacy is a mastery experience. The mastery experience is the most influential way to

reflect on the results of one's prior performances. Individuals engage in tasks and activities, interpret the results of their actions, use the interpretations to develop beliefs about their capability to engage in subsequent tasks or activities, and then act in concert with the beliefs created.

It was also found that the malaria officers who participated in the empowerment training program had higher mean scores of overall job satisfaction in every aspect of the professional work environment, including autonomy, work worth, within/between professional relationship, and role enactment. These results were congruent with the study of March *et al.*, 2004, Patel, 2005; Osterberg, 2005; Haynes, 2006

After the empowerment training program, the researcher organized a workshop to develop prototypes of user friendly tailored IEC materials. The IEC messages and materials were developed by the researcher and health education staff involved with the local health providers. The purpose of these materials was to increase adherence to anti-malaria treatments in specific target audiences based on the study of the patient's needs, similar to the processes used in a previous study (Sharma, 2002). The workshop developed guidelines and procedures to educate vivax malaria patients to adhere to anti-malarial drug treatment. These procedures addressed the crucial factors influencing drug adherence found in this study.

The researcher and malaria officers tailored the IEC materials to different patient ages. In addition, the materials were specific to culture, religion, and other characteristics of the target populations. The materials were tailored based on the results from the initial phase of the study as well as input from participants. The prototypes materials were tested with a sample of vivax malaria patients outside the study area and also tested with secondary stakeholders, such as health care providers in Chiang Mai. The testing was intended to assess comprehension, validity, reliability, and acceptance among the vivax malaria patients (users) and malaria officers (health care providers). Participants were asked to describe characteristics they liked or disliked. They responded that the preferred materials were "short and to the point," used bright and vibrant colors, and included interesting pictures, which were congruent with similar findings in the literature (Atreja *et al.*, 2005). To produce easy-to-read materials, the participants recommended using large bold fonts and avoiding complicated medical terms. The tailored IEC materials had to be

revised three times in order to improve upon their user-friendliness and message comprehension before application into study settings.

The participation of the malaria officers in the design and testing of the materials and guidelines greatly increased their sense of ownership and accomplishment, as shown in Figure 9. After piloting the materials, prototypes were produced with pictorial printed materials, including posters, pamphlets, flip charts, and drug bags showing direction of malarial drug prescriptions with specific messages to three age groups: 3-7, 8-13, and 14 years and older. These were translated from the colloquial Thai to the local dialects: Thai Yai and Karen (Figure 10).



Malaria workers had greater confidence to educate his patients in the clinic because he had empowerment and tools; flipchart, poster, pamphlets, and labeled drug bag.

**Figure 9** A malaria officer at his station at a clinic in the intervention area.



These educational brochures containing information on malaria and malaria treatment are tailored to different ages, ethnicities, and dialects. Brochures are free for patients to take home.

**Figure 10** Three-fold brochures sized 29.5 x 21 cm.

**Objective three:** To implement and evaluate the IEC program's effectiveness with vivax malaria patients at malaria clinics, focusing on adherence to anti-malaria treatment.

After the ETP, IEC materials were produced as a tool for the implementation phase (see appendix C). The malaria officers followed a standardized chart describing the IEC process with vivax malaria patients at malaria clinics. The malaria officers used interpersonal communication, supplemented with various kinds of IEC materials, to improve knowledge of malaria, perception of malaria treatment, self-efficacy in taking anti-malaria drugs, and service satisfaction. Even with IEC materials, interpersonal communication remains critical in helping patients better understand what malaria is. Therefore, malaria officers communicated using a wide variety of verbal and nonverbal cues that were also covered during the ETP. Furthermore, it is important for those involved in interpersonal communication to be able to provide feedback to each other. Therefore, malaria officers gave patients the opportunity to ask the questions on whether they understood malaria, malaria prevention and their treatment.

The results of the implementation phase supported hypothesis 2 as related to following aspects:

1. Knowledge of malaria:

Before launching the implementation program, knowledge levels of both the intervention and the control groups were at moderate levels (Table 25). There was no significant difference found between the two mean knowledge scores. After program implementation, the mean knowledge score in the intervention group was significantly higher, having increased from approximately 65% to 82% (mean scores of 9.8 out of 15 before intervention and 12.26 out of 15 after intervention, with standard deviations of 2.3 and 1.9, respectively). This suggests that the tailored, user-friendly IEC materials, such as posters, flipcharts, and pamphlets, were effective in educating patients on malaria knowledge. Health education messages in the IEC program addressed a variety of misconceptions regarding the knowledge of malaria and use of anti-malarial. Furthermore, it contained directly relevant information, which increased attentiveness and limited defensiveness to the messages. Therefore, malaria knowledge in the intervention group increased after attending the IEC program. These improvements were similar to a study by Njama *et al.*, (2003), which found that increased education was associated with increased malaria knowledge. In contrast, the control group, which did not receive the IEC program but instead received the standard verbal health education, did not see an

increase in malaria knowledge (mean scores of 10.0 out of 15 before and 10.2 out of 15 after, with standard deviations of 2.6 and 2.1, respectively).

## 2. Perception of malaria treatment:

Before implementation, mean perception scores between the intervention and control groups were similar to each other. After program implementation, perception scores in the intervention group were significantly higher, having increased from approximately 76% to 84% (mean scores of 22.7 out of 30 before intervention and 25.3 out of 30 after intervention, with standard deviations of 2.7 and 3.1, respectively). Perception scores in the control group did not change significantly.

Baseline malaria perception scores were high among those who lived in or were exposed to disease transmission areas, where malaria cases were highly prevalent throughout the year. Living in high transmission areas, they also received information about malaria from annual malaria campaigns. Another factor affecting perception was revealed in the focus group discussion, where it was suggested that patients perceived antimalarial medication from the malaria clinics throughout Mae Hong Son as more effective. If they had a headache they would immediately go straight to the malaria clinic to check their blood. This may be because patients have the perception that they were more vulnerable to malaria, and thought that malaria is serious in their communities.

## 3. Self-efficacy to perform adherence to antimalarial drug

In this analysis, data was collected only after the implementation program was completed in order to avoid leading questions and information bias. The mean scores of self-efficacy to adhere to antimalarial treatment in the intervention group were significantly higher than that of the control group (Table 26). Self-efficacy was 22% greater in the intervention group (mean score of 40.5) than the control group (mean score of 33.2). In accordance with Bandura's social cognitive theory (1986), which states that people's behaviors could often be better predicted by the beliefs they hold about their capabilities than by what they were actually capable of accomplishing, self-efficacy may have helped determine what the individual did with their knowledge and skills. After the vivax malaria patients participated in the IEC Program, patients had their treatment instructions and information on how to adhere with the treatment. They interpreted the results of their actions based on understanding the benefits of treatment. They used the interpretations of the results of their actions to develop beliefs about their capability and

motivation to adhere to the treatment. They acted in concert with their beliefs that were created from the information obtained from the IEC Program. As defined by Bandura (2001), the result of this evolution in “internalizing” the knowledge, the results and benefits of their actions, they successfully raised their self-efficacy.

4. Adherence behavior to anti-malarial prescription:

Adherence was evaluated after the implementation program by asking the patients about their actions during the treatment. Adherence was 70% in the Intervention Group and 30% in the Control Group (Table 30). This measure of adherence was based on the patients self-reporting that they followed the course of the treatment regimen as directed. Patients were also asked questions to see if they remembered the color, packaging, duration of treatment, and their understanding of the prescription label and instructions. Of these questions, the Intervention Group answered correctly 88% (a mean score of 9.7 out of 11 with a standard deviation of 1.3) (Table 28), which suggests that 71% adherence in the Intervention Group is valid. These results suggest that the IEC program, using tailored IEC materials with illustrations such as flipcharts, posters (Figure 11), pamphlets, and new paper drug bags, were effective in educating patients on malaria and malaria treatment. In the flipchart, for example, there were details describing general information on vivax malaria, the causative agent, symptoms, prevention, and treatment. In the past, the treatment was quite difficult for people to understand. However, flipcharts greatly assisted the patients in remembering the type, action, and doses of the medicines they would have to take (Figure 12).

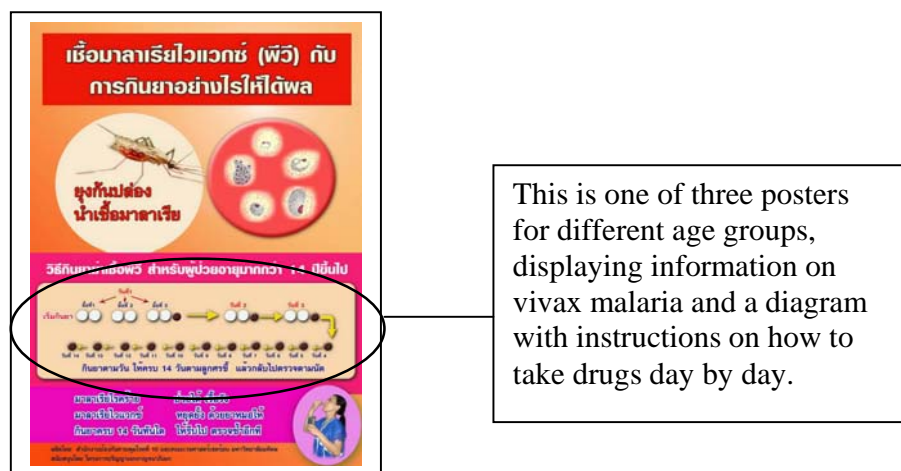
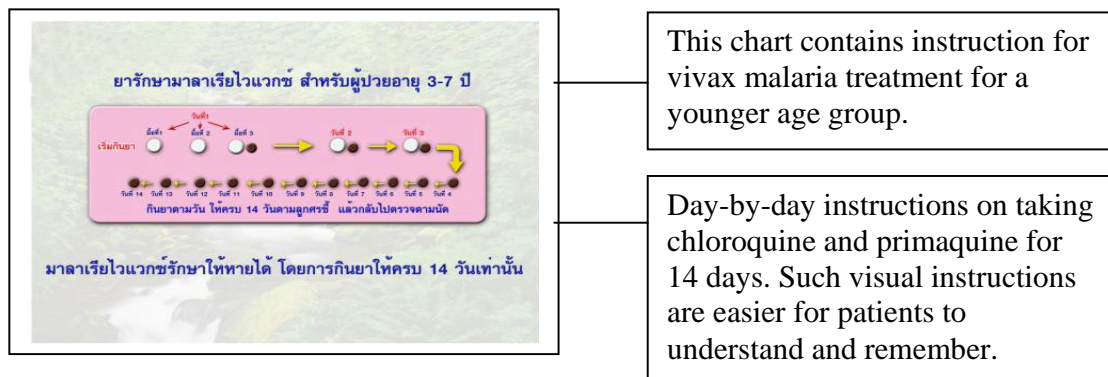


Figure 11 A poster illustrating vivax malaria and treatment information sized 69 x 89 cm.



**Figure 12** A page in the flipchart showing instructions on taking antimalarial medication.

Not only did the program use visual IEC materials, but also good verbal instructions from the malaria officers. The malaria officers were trained to give good IEC messages; short, accurate, and relevant, and disseminated in the patient's native language using IEC materials as visual aids in both interpersonal as well as group discussions. The malaria officer allowed opportunities for the patient to ask questions to facilitate two-way communication. Furthermore, the malaria officer explained how to store and take the medication while living at home, as well as encouraging family participation by having family members remind the patient to take the medication. Patients were provided their medication in a paper bag, which included instructions on treatment depending on their age. As seen in Table 31, most of the vivax malaria patients (97.8%) in the intervention group were satisfied with the newly designed bag labels, which had instructions on how to take drugs on a day-by-day basis. In focus group discussions, A patient remarked that *"The new bag is very easy to understand and follow. I know how to take the medicine with each meal and it also reminds me to check my blood on the appointment date."* The drug bag is displayed in Figures 13 and 14. As reinforced in the literature, the increased adherence may be attributable to the IEC Program's improved materials and treatment guidelines. Ansah *et al.* (2001), Okonkwo *et al.* (2001), Agyepong *et al.* (2002), Killian *et al.* (2003), Sirima *et al.* (2003), and Kolaczinski *et al.* (2006) reported that adherence to anti-malarial drug treatment regimens increased when medications were dispensed in packages that contained clear instructions on the package itself.

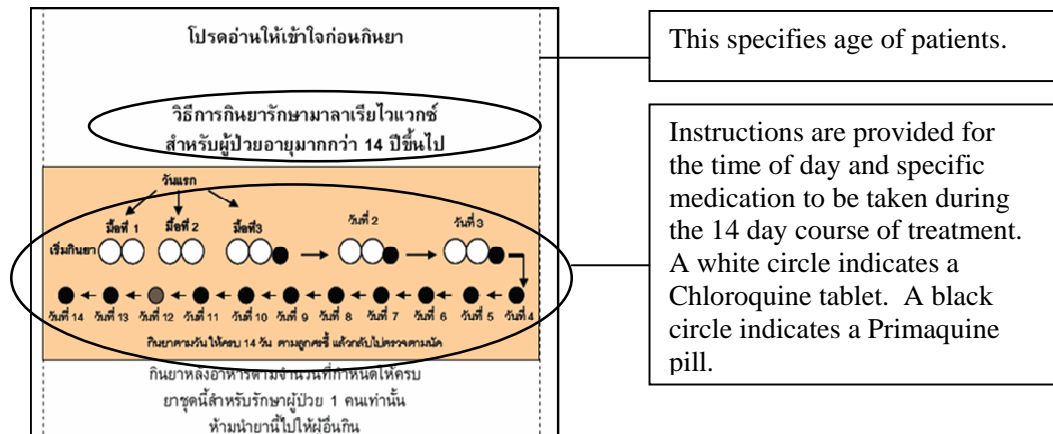


Figure 13 Back side of the newly designed drug bag sized 13 x 15 cm.

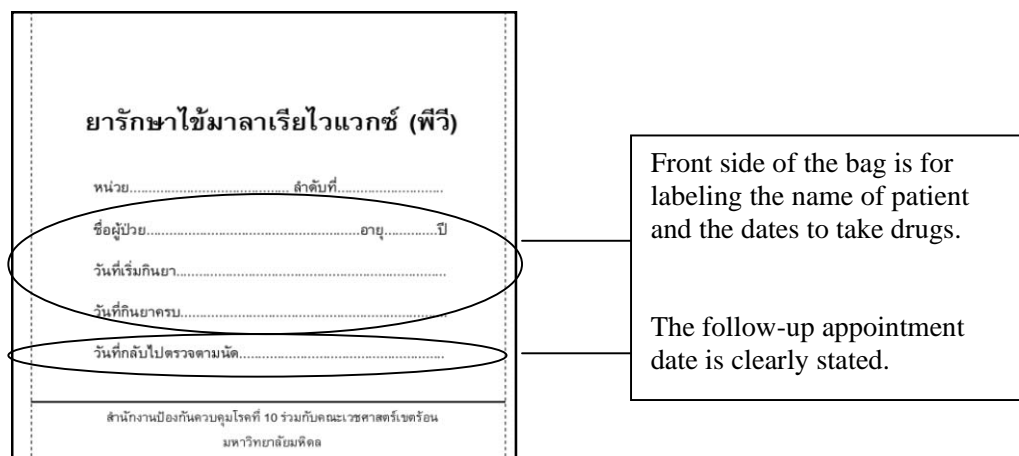


Figure 14 Front side of the newly designed drug bag sized 13 x 15 cm.

5. Satisfaction of health care service in the malaria clinics.

Satisfaction of health care service was assessed using a questionnaire after IEC implementation. The satisfaction of health care service questionnaire design was based on the concepts and principles of Whitley and Putzier (1994), who developed the job quality indicators. Service satisfaction focused on four topic areas: convenience, information received, coordination of services, and the quality of care. The service satisfaction mean scores for the intervention group were significantly higher for all services than for the control group (Table 28). The intervention group’s satisfaction of healthcare services was approximately 95% (mean score of 76.9 out of 81 with a standard deviation of 4.6) compared to the control group’s 70% (mean score of 63.6 out of 81 with a standard

deviation of 5.6). Focus group discussions with patients also qualitatively evaluated satisfaction of services. Patients were generally very satisfied with the care provided at the malaria clinics, particularly when compared to other health care providers. Some of the reasons that patients preferred malaria clinics over traditional hospitals are that hospitals require payment and often have long waits to see a doctor. Because patients are in general very satisfied in using malaria clinics, focus group discussions revealed that patients did not hesitate to get their blood checked at a clinic if they showed symptoms of malaria, such as a headache and fever. Furthermore, because malaria clinics are located in villages, they were much more convenient to access. Overall, malaria clinics were preferred to hospitals, not only because they were convenient, free, and quick, but because malaria officers took time to educate patients on their illness, explained the treatment in detail, and provided clear instructions on the drug bags and on IEC materials.

## **CHAPTER VI**

### **CONCLUSIONS AND RECOMMENDATIONS**

This chapter contains three parts. The conclusion has been summarized in the first part, recommendations from this study are in the second part, and recommendations for future research are in the final part.

#### **6.1 CONCLUSIONS OF THE STUDY**

The objective for this quasi-experimental research study was to assess the effectiveness of information, education, and communication (IEC) programs in increasing adherence to vivax malaria treatment among patients at malaria clinics (MC) in Mae Hong Son Province. Nine MCs in Muang District, Mae Hong Son Province, were identified as intervention clinics. These clinics were Pha Bong, Pang Mu, Pa Lan, Huai Sua Tou, Huai Pong, Mai Sa Pei, Mai Dua Ghom, Muang, and Ban Klang. Three MCs in Mae Sa Riang District, Mae Hong Son Province, were identified as control clinics. These clinics were Mae Sa Riang, Ban Gard, and Tha Ta Phang. These two districts were selected because both had the highest vivax malaria incidence rates in Thailand in recent years and because the geography of the two districts is similar. The study consisted of two phases; first, a preliminary study was conducted to collect base-line survey data, and second, the actual intervention with the IEC program was implemented. The tools used for data collection consisted of structured questionnaires for quantitative data, and focus group discussions for qualitative data. The intervention consisted of training processes, IEC materials production, and evaluation forms. The data were analyzed using the STATA statistical software program version 8.0 (STATA Inc., College Station, TX). Data analysis consisted of Chi-square test/Fisher exact test for analysis of categorical data and Student's t-test, paired t-test, and One-way analysis of variance for analysis of continuous data. In addition, logistic regression was used to control for potential confounding variables. The conclusions to this study can be organized according to the study hypotheses as follows:

**HYPOTHESIS 1:** After attending the empowerment training program, which utilized participatory learning, and contributing to the development of the IEC program,

the malaria officers improved their self-esteem and self-efficacy behaviors and improved their ability to implement the IEC program to vivax malaria patients in their malaria clinics.

This study accepts Hypothesis 1 as described in the following research activities:

1. The Preliminary Phase: This phase consisted of four stages as follows;

1.1 The preliminary study: This study was a retrospective study. We interviewed 206 vivax malaria patients who visited twelve malaria clinics in Muang and Mae Sa Rieng Districts between 1 October 2005 and 30 September 2006 with questionnaire set 1. The results indicated that 76.2% of the patients did not complete the medication course. The adherent and non-adherent patients were similar in terms of gender, age, ethnicity, education level, and income. The adherent subjects were more likely employed in forest-related occupations. The patient's adherence was also significantly associated with knowledge of malaria scores ( $p=0.000$ ) and access to information on antimalarial medication scores. Additional analyses of the access to information on antimalarial medication scores revealed several specific sub-factors that were associated with adherence, including understanding and remembering how to take the medicine. In regards to specific questions used to assess the knowledge of malaria score, adherence to anti-malaria treatments was more likely among patients who strongly desired to cure the disease, in particular those who were knowledgeable about the transmission of malaria, mosquitoes breeding sites and preventive methods to avoid malaria.

1.2 The development process of the empowerment training program (ETP) on IEC strategies: Developing the ETP improved knowledge of malaria, such as diagnosis, treatment, prevention and control of malaria, all specific to age groups. In addition, the training taught team building, leadership skill, problem solving, identification of possible IEC materials, health education service skills, and basic communication skills including planning, monitoring, and evaluation for malaria treatment and drug adherence for vivax malaria patients.

1.3 Organizing the ETP: Seventeen malaria officers from the nine MCs in the intervention area completely participated in the ETP for three days. Fifteen of them were males, with a mean age of 41 years, and 70.6% graduated from secondary school. They had an average of 14 years experience in health education services working in the MCs. Languages spoken included Thai, Thai Yai, and Karen. We found significant differences

in average scores for most behaviors measured (self-efficacy, health education skills on IEC process and structure, and job satisfaction) after the three measurements comprising before ETP, before the implementation of IEC program, and 3-months after the implementation program. There were no differences in the average scores for self-esteem and IEC service skill measurement. These findings supported hypothesis 1.

1.4 Intervention development: The implementation program set monthly meetings for malaria officers in the intervention area. All participants were able to share experiences, to plan the IEC package and to organize the instruction schedule. They were also able to produce the tailored, user-friendly IEC materials combined with pictorial printed materials and specific messages developed to meet the information needs of different patient groups. The messages were then interpreted to the local languages and displayed on posters, pamphlets, flip charts, drug bags, as well as verbal communications. All materials were tested until acceptable validity and reliability were achieved.

**HYPOTHESIS 2:** Vivax malaria patients will have increased knowledge, perception of malaria and malaria treatment, perception of benefit and barriers of drug adherence, self-efficacy in drug taking, and satisfaction of health services and the IEC program from the malaria clinics, which will lead to behavioral changes in patients resulting in increased adherence to anti-malarial treatment.

## 2. The Implementation Phase:

2.1 Participating vivax malaria patients in the study were comprised of 142 (54.8%) persons in the intervention area and 117 (43.2%) in the control area. A majority of the patients in both groups were male. About 46% were older than 30 years of age. Approximately 50% of them were non-marital status (single, separate or divorced). More than 50% of both the groups were Thai Yai, Karen, and Burmese and the same proportion finished at least primary school (Grade 6). About 35% worked as employees earning a monthly income of less than 2,000 Baht. Around 80% of the patients had not experienced vivax malaria infection in the past year.

2.2 Knowledge and perception of malaria treatment, self-efficacy to perform drug adherence to anti-malarial drug treatment, adherence to anti-malarial drug prescription and service satisfaction.

2.2.1 Knowledge of malaria: Both the intervention and control patients had low or moderate levels of knowledge scores before the intervention. After implementing

the IEC program, the level of knowledge increased in the intervention group. The mean knowledge score of the intervention group was significantly higher than that of the control group.

2.2.2 Perception of malaria treatment: At the beginning of the study, the majority of all the patients in both groups had a moderate level of perception and they were not significantly different between groups. However, after implementation, the mean score of the intervention group was significantly higher than that of the control group.

2.2.3 The self-efficacy to perform adherence to anti-malarial drugs for treatment: After implementation, the intervention group had high levels of self-efficacy while the control group had moderate and low levels. The mean self-efficacy score of the intervention group was significantly higher than that of the control group.

2.2.4 Adherence to anti-malarial prescription: After the implementation, the mean adherence to anti-malarial prescription score of the intervention group was significantly higher than that of the control group. The adherence rate in the intervention group was 71.1% and the rate in the control group was 29.9%. Moreover, 80.3% of the patients in the intervention group adhered to the appointment date whereas the control group was 63.2%.

2.2.5 Satisfaction of services: After implementation, the patients in the intervention group possessed a higher level of satisfaction toward health care services from the malaria clinics. At the same time, the control group had only the moderate level of service satisfaction. Furthermore, the mean service satisfaction score of the intervention group was significantly higher than that of the control group. When vivax malaria patients were assessed of their satisfaction specifically toward the IEC materials, more than 80% were highly satisfied with the newly designed drug bag, flip charts, and posters.

This finding supported Hypothesis 2, which states that after IEC program implementation, the mean scores of the intervention group regarding knowledge, perception of malaria treatment, self-efficacy in drug taking, and satisfaction of health services and the IEC program were significantly higher than before the intervention and significantly higher than that of the control group.

## 6.2 RECOMMENDATIONS

Recommendations are as follows, that

1.) The crucial factors that associated with drug adherence in this study were the knowledge scores of malaria and the access to information on antimalarial medication scores. In particular, there is evidence that if patients perceive the benefits and barriers of malaria treatment, they are encouraged to adhere to anti-malarial treatments. These factors are needed for educating vivax malaria patients on knowledge of malaria and its treatment with simple health messages and encouraging them to adhere with their treatment.

2.) The empowerment program and IEC package converge. Involvement of the malaria officers in capacity building as well as in persuading the vivax malaria patients to adhere the drugs of treatment is of paramount importance. There should be an incentive program for malaria officers to increase efficacy in instruction. At the same time, malaria officers should be involved in the task of developing IEC materials, which should be widely disseminated in the form of posters, flip charts, and pamphlets in all malaria clinics.

3.) The development of IEC programs for vivax malaria patients to reach standardization of health care will help services in malaria clinics, which similar context to this study. The friendly tailored IEC materials are for educating and encouraging the patients to complete their medication for 14 days. The objective of the tailored IEC materials are as following:

3.1) Flip charts are for teaching the vivax malaria patients and their relatives after getting the result of blood examination. The utilization of these materials by malaria officers is to teach the patients in details of knowledge malaria life cycle, signs and symptoms, blood examination, medication instructions, side effects of medication and how to cease sickness, and to emphasis on an appointment date.

3.2) Newly designed drug bags are for supplement the patients to take chloroquine and primaquine correctly at home from day one to day 14. The objective of using a medicine bag was not only to remind the date of start and completion drug taking, it includes the date of appointment for blood re-checking after completion the drugs.

3.3) Pamphlets provide information about knowledge of malaria in term of life cycle of malaria, malaria sign and symptoms, blood examination how to take the

medications correctly, and suggest how to release side effects from antimalarial medications.

3.4) Posters stick on the wall in the IEC instruction room at malaria clinics at all time. The objective of posters was for educating patients to know vivax malaria life cycle. A diagram instructing medication taking displays a direction from day 1 to day 14 that needs patients to complete their medication course of vivax malaria, and emphasizes on an appointment date and time to follow up the parasites in blood.

4.) Refreshment of an empowerment program is necessary at least once a year through active participatory learning among the malaria officers.

5.) The study supports the hypothesis that the IEC program is successful in increasing adherence to anti-malaria treatments. These results support development of IEC packages on a large scale, targeting all malaria clinics where vivax malaria is endemic.

### **RECOMMENDATIONS FOR FURTHER RESEARCH**

The health education methods developed from this research could be applied throughout the National Malaria Control Program with the goal of reducing the incidence of vivax malaria. Although analysis of the social factors in this study is unique, this leads to limitations as well. For instance, since adherence is self-reported, there is potential for bias in the results. To alleviate this and increase the reliability of the data, using pharmacokinetic thresholds measuring blood level of Primaquine after treatment could be used to confirm adherence. In light of the forgoing research, the recommendation of this study is to conduct further analysis of IEC implementation on a wider scale, as well analysis on the effectiveness of training of malaria officers using ETP in order to change patients' behaviors with regards to medication awareness, follow-up, fever relapses, and protection of re-infection.

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## **APPENDIX**

## APPENDIX A

### QUESTIONNAIRE SET 1

This set of questionnaire is an interview questionnaire for collect baseline on drug adherence among vivax malaria patients in Mae Hong Son Province. There are 6 Parts as follows;

Part 1: General Information

Part 2: Knowledge of Malaria and Malaria history

Part 3: Perception on malaria and malaria treatment

Part 4: Access to information on antimalarial medications

Part 5: Health care services at malaria clinics

Part 6: Social supports

#### **PART I: General Information**

**Instructions:** Please check ✓ in ( ) or fill in .....

If patient aged less than 14 years, please fill in the box.

Name of patient.....Age.....years old. Gender ( ) Male ( ) Female  
Address .....

1. Questions answered by:
  - ( ) 1. Patient, who is an interviewee
  - ( ) 2. Parents (If patient aged <14 years old)
  - ( ) 3. Other (Please specify).....
2. Age of interviewee.....years old.
3. Gender ( ) 1. Male ( ) 2. Female
4. Marital status ( ) 1. Single ( ) 2. Married ( ) 3. Widowed/Divorced/Separated
5. Nationality ( ) 1. Thai ( ) 2. Thai Yai ( ) 3. Karen ( ) 4. Other (please specify).....
6. Educational level
  - ( ) 1. Did not attend school ( ) 2. Primary school
  - ( ) 3. Secondary school ( ) 4. Vocational school
  - ( ) 5. Bachelor degree or higher ( ) 6. Other (please specify).....
7. The ability of your language
 

Speaking ( ) 1. Thai ( ) 2. Karen ( ) 3. Thai Yai ( ) 4. Burmese ( ) 5. Other.....

Writing ( ) 1. Thai ( ) 2. Karen ( ) 3. Thai Yai ( ) 4. Burmese ( ) 5. Other .....

8. Your main occupation
  - ( ) 1.Children/student/housewife                      ( ) 2.Employee
  - ( ) 3.Business/trader/merchant                      ( ) 4.Government/Private enterprise
  - ( ) 5. Farmer/agriculturist/fruit orchard                      ( ) 6. Forester
  - ( ) 7. Other (please specify).....
9. Your average income per month ..... Baht (Only income of interviewee)
10. Number of your family members....persons (Only persons who are living in your house)

**PART II: Knowledge of Malaria and Malaria history**

**Instructions:** Please check ✓ in the ( ) or fill in ..... according to the patient’s answer.

1. How is malaria transmitted?
  - 1.1 By mosquito biting                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 1.2 By drinking water containing mosquito larvae ( ) 1. No ( ) 2.Yes ( ) 3. Uncertain
  - 1.3 By drinking raw stream water in the forest ( ) 1. No ( ) 2.Yes ( ) 3. Uncertain
  - 1.4 Because of a super natural force ( ) 1. No                      ( ) 2Yes                      ( ) 3. Uncertain
  - 1.5 Do not know                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3.Uncertain
  - 1.6 Other (specify).....
2. Where are breeding places of malaria mosquitoes?
  - 2.1 Stagnant water in the house                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 2.2 Stagnant water around the house ( ) 1.No                      ( ) 2. Yes                      ( ) 3. Uncertain
  - 2.3 Slow running stream                      ( ) 1. No                      ( ) 2. Yes                      ( ) 3. Uncertain
  - 2.4 Animal footprints                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 2.5 Do not know                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 2.6 Other (specify) .....
3. What is/are method(s) to protect against mosquito bites? (Do not lead answers)
  - 3.1 Sleep under mosquito net                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 3.2 Sleep under impregnated mosquito net( ) 1. No ( ) 2.Yes ( ) 3. Uncertain
  - 3.3 Spray house with chemical                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 3.4 Wear long clothing                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 3.5 Apply mosquito repellent                      ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 3.6 Grow lemongrass around house ( ) 1. No                      ( ) 2.Yes                      ( ) 3. Uncertain
  - 3.7 Burn mosquito coils                      ( ) 1. No                      ( ) 2. Yes                      ( ) 3. Uncertain
  - 3.8 Keep a fire smoking                      ( ) 1. No                      ( ) 2. Yes                      ( ) 3. Uncertain
  - 3.9 Drive mosquitoes away with electric fan ( ) 1. No ( ) 2. Yes ( ) 3. Uncertain
  - 3.10 Other (specify).....

## 4. What are symptoms of malaria? (Do not lead answers, can be more than one answer)

4.1 Headaches  1. No  2. Yes  3. Uncertain4.2 Fever  1. No  2. Yes  3. Uncertain4.3 Shivering  1. No  2. Yes  3. Uncertain4.4 Sweating  1. No  2. Yes  3. Uncertain4.5 Muscle pain  1.No  2.Yes  3. Uncertain4.6 Nausea/vomit  1.No  2. Yes  3. Uncertain4.7 Anemia  1.No  2. Yes  3. Uncertain4.8 Convulsion  1. No  2. Yes  3. Uncertain4.9 No signs or symptoms  1. No  2. Yes  3. Uncertain

4.10 Other (please specify) .....

## 5. Since January 2005, how many times have you got malaria? .....Times.

## 6. When was the last time you have malaria? Date ..... Month.....Year .....

## 7. At the time you got malaria;

## 7.1 Who took you to the malaria clinic?

 1. Went by myself  2. Other (please specify).....

## 7.2 Who took care of you and gave you the anti-malarial drugs at home?

 1. Myself  2. Other (please specify).....

## 8. Did the malaria officer tell you about the type of malaria you were infected?

 1. Yes, but do not remember  2. No, I was not told 3. Pf  4. Pv  5. Other (please specify).....**PART III: Perception of malaria and malaria treatment****Instructions:** Please check ✓ one of the choices provided according to the patient's choice for each statement

Statements	Agree	Uncertain	Disagree
1. Becoming infected with malaria is quite common.			
2. Everyone is at risk for getting malaria.			
3 Only weak persons can get infected with malaria			
4. If you forgot to take drug, you should retake it immediately.			
5. Staying overnight in the forest puts one at risk for malaria contraction.			
6. There is a greater risk for malaria infection when traveling into the forest in the rainy season than any other seasons.			
7. You should go straight to the malaria clinic immediately to have your blood checked if you feel sick.			
8. You should take time off from work to have your blood checked for malaria.			
9. Showing symptoms of headache, fever and weakness is to suspect that it is malaria.			

Statements	Agree	Uncertain	Disagree
10. Malaria patients are unable to work while they are sick			
11. If needed to be cure, you must take all of the provided drugs			
12. Death may occur if a person have inappropriate treatment for malaria			
13. Malaria patients can be re-infected you did not complete medication			
14. Sleeping under a mosquito net every night can prevent malaria infection			
15. Insecticide spraying should be done only in malaria patient's house			

**PART IV: Access to information on antimalarial medications**

**Instructions:** Please check ✓ in the ( ) or fill in .....according to the patient's answer

1. How long did you to take anti-malarial pills to treat your malaria?  
 ( ) 1. Do not remember ( ) 2. 14 Days ( ) 3. Other (please specify) ..... Days
2. Do you remember the colors and pills that you received from the malaria clinic?  
 ( ) 1. No  
 ( ) 2. Yes, how many tablets did you get and what were the colors of the drugs? (Please specify)  
 ( ) 2.1 White colors, how many?.....Tablets/ Or how many days? .....Days  
 ( ) 2.2 Brown/black, how many?.....Tablets/ Or how many days? .....Days
3. What type of drug package did you receive from malaria clinic?  
 ( ) 1. Do not remember  
 ( ) 2. One plastic bag (mix of Chloroquine and Primaquine)  
 ( ) 3. Two plastic bags (one containing Chloroquine and one containing Primaquine)  
 ( ) 4. Three plastic bags (Chloroquine, Primaquine and Paracetamol)  
 ( ) 5. More than 3 plastic bags (plastic bags divided according to meals)  
 ( ) 6. Other (please specify) .....
4. Did you take your first tablets at the malaria clinic immediately after you received them?  
 ( ) 1. No  
 ( ) 2. Yes  
 ( ) 3. No, I firstly started at home  
 ( ) 4. Other (please specify).....
5. Did you clearly understand the drug label and instructions?  
 ( ) 1. Illiterate ( ) 2. Not clear, because .....  
 ( ) 3. Clear ( ) 4. Other (please specify) .....

6. Did the malaria clinic officer clearly explain to you to complete the drugs when providing instructions?

- 1. Did not explain (go to No.8)
- 2. Do not remember (go to No.8)
- 3. Yes, he/she prescribed to take drugs from each separate bag and take the remaining each tablet a day.
- 4. Yes, he/she explained to take drugs daily as prescribed on each bag.
- 5. Other (please specify) .....

7. Did you understand all of the details; Drug label and instructions?

- 1.No     2.Yes     3.Do not remember     4.Other (please specify) .....

8. Please show me how you took the medicine each day? (**Do not lead answers**)

**(Interviewer gives a set of anti-malarial drugs to the patient and allows him/her to show how they took the drugs each meal or each day)**

Day	Details	Take drug		Day	Details	Take drug	
		X	✓			X	✓
1	1 <sup>st</sup> meal			7.			
	2 <sup>nd</sup> meal			8.			
	3 <sup>rd</sup> meal			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			

9. Did you take the drugs correctly each day?

- 1.Yes     2. Sometimes     3. No     4. Not sure/ Do not remember

10. Did you take the drugs on time every day?

- 1.Yes     2. Sometimes     3. No     4. Not sure/ Do not remember

11. Did you take the drugs every meal that you were given?

- 1. Yes     2. Take some meals     3. Not at all     4. Not sure/ Do not remember

12. Did you continue to complete drugs even after you felt better?

- 1. No (go to No.14)     2. Yes, but irregularly     3. Yes, took them all

13. Which colors of the drugs did you not finish? Why?

- 13.1 White     1. Finished all (go to No. 15)     2. Did not finish
- 13.2 Brown/black     1. Finished all (go to No. 15)     2. Did not finish

14.If you did not complete all of the drugs, where did you keep the remaining pills?

- 1. At home
- 2. Threw them away
- 3. Other (please specify).....

15.What were the side effects, if any, of taking anti-malarial drugs? (please check all that apply)

- 1. Nothing
- 2. Nausea/vomiting/dizziness
- 3. Abdominal pain/diarrhea
- 4. Changing color of urine
- 5. Other (please specify) .....

16.Did you observe the color of your urine while taking anti-malarial drugs?

- 1.No     2. Yes, what was the color of your urine? (please specify)
  - 2.1Dark yellow
  - 2.2 Brown
  - 2.3 Red
  - 2.4Other (please specify).....

17.Did you return for your appointment at the malaria clinic to follow up on your blood examination?

- 1. No (go to No. 19)
- 2. Rescheduled for another date/time due to .....
- 3. Yes

18.Regarding the blood results from your follow-up visit to the malaria clinic, were you continuously prescribed different anti-malarial drugs?

- 1.No, blood result was negative
- 2.Yes, because blood result showed that you had:
  - 1. Pf
  - 2. Pv
  - 3. Other.....

19.Could you provide ideas on how anti-malarial drugs could be better packaged in order to make it easier for you to take them?

- 1. Assemble all pills in one plastic bag
- 2. Divide all of the pills according to each meal
- 3. Provide pills in a plastic and foil pop-out sheet
- 4. No need to change the packaging
- 5. Other (please specify) .....

**PART V: Health care service at malaria clinics**

**Instructions:** Please check ✓ one box according to the patient’s answer

Health care service items	No	Uncertain	Yes
1. While waiting for your blood test results at the clinic, you were provided health education and knowledge about malaria.			
2. The malaria officer provided you with your blood test results.			
3. The malaria officer clearly explained the drug administration to you.			
4. The malaria officer advised you taking care yourself while you were sick.			
5. You were provided a booklet/pamphlet to gain knowledge about malaria.			
6. The materials used for patient treatment were available.			
7. The malaria officer clearly provided you with an appointment card.			

**PART VI: Social supports during got malaria**

**Instruction:** Please place check ✓ in one box according to the patient’s answer

Items	No	Uncertain	Yes
1. Anyone of your family members helped you at home and/or at work during the period that you were sick.			
2. Anyone of your family members encouraged you to follow the instructions and suggestions given to you by the malaria officer.			
3. Newspapers, radio, and television set provide you with useful information on health promotion.			
4. You received good services from malaria officer.			
5. The malaria officer advised you to take care your health.			
6. You complied and followed the suggestion that the malaria officer advised you how to take anti-malarial drugs.			
7. Your neighbors reminded you to take anti-malarial drugs.			
8. Health volunteer encourages you to take care your health.			

**Part VII: Problems, barriers and suggestions regarding how to encourage vivax malaria patients to comply with a given treatment regimen (please specify)**

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**APPENDIX A**  
**QUESTIONNAIRE SET 2**

This set of questionnaire is for malaria officers regarding implementing according to IEC program for vivax malaria patients. There are 4 Parts as follows;

Part 1: General information

Part 2: Self-esteem

Part 3: Self-efficacy in implementing IEC package to encourage vivax malaria patient to complete their drug prescription

Part 4: Job satisfaction of implementing IEC program and health services in malaria clinics

**PART I: General Information**

**Instructions:** Please check ✓ in ( ) or fill in .....

1. Your age.....years old.
2. Gender ( ) 1. Male ( ) 2. Female
3. Marital status ( ) 1. Single ( ) 2. Married ( ) 3. Widowed/Divorced/Separated
4. Your highest educational  
 ( ) 1. Secondary school ( ) 2. Vocational school  
 ( ) 3. Bachelor degree or equivalent ( ) 4. Other (please specify).....
5. The ability of your language  
 Speaking ( ) 1. Thai ( ) 2. Karen ( ) 3. Thai Yai ( ) 4. Myanmar ( ) 5. Other.....  
 Writing ( ) 1. Thai ( ) 2. Karen ( ) 3. Thai Yai ( ) 4. Myanmar ( ) 5. Other ....
6. Your average income per month ..... Baht
7. Your work experience .....Years

**PART 2: Self-esteem**

**Instruction:** kindly read each of the following statements and check ✓ in one of three choices provide that mostly matches with your feeling/opinion.

Level of your opinion:

Agree: The statement match with all of your opinion.

Uncertain: The statement may or may not match with all of your opinion.

Disagree: The statement does not match with your opinion at all.

Statement	Level of self-esteem		
	Agree	Uncertain	Disagree
1. Overall, you satisfy with yourself.			
2. You think that you are valuable person.			
3. Sometime, you think that you do not have any good thing.			
4. You think that you can not work as good as other person.			
5. You feel very little proud of yourself.			
6. Sometime, you feel that you are not useful at all.			
7. You feel that you are valuable as other person.			
8. You need to add more self-esteem.			
9. Totally, everything you have done was failed.			
10. You always have the great feeling about yourself.			
11. Your colleagues always recognize and honor yourself			
12. You are the person that everybody contacted with you, she/he will be happy.			
13. Your colleagues accept your working ability.			
14. Your supervisor accepted your knowledge and your working ability.			
15. You are respected person for the other persons.			
16. Most of people accepted your opinion.			

**PART 3: IEC program for vivax malaria patients to improving adherence to their drug prescriptions** divided into 2 parts as follows:

3.1 Self-efficacy in implementing IEC program in malaria clinics

- Level of ability    High: You have high willingness and attend to do  
 Moderate: You have moderate willingness and attend to do  
 Low: You have low willingness and attend to do

3.2 Skills according to developed IEC program in malaria clinics

- Level of ability    Able: You could accomplish the task assigned  
 Unsure: You are not sure to accomplish the task assigned  
 Unable: You could not accomplish the task assigned

Statement	Level of self-efficacy			Level of practice		
	High	Moderate	Low	Able	Unsure	Unable
<b>Process of IEC Program</b>						
1. You plan IEC program for vivax malaria patients in malaria clinic effectively e.g. the plan is developed from the participation of the team, the plan has covered health promotion to encourage patients complete their drug prescriptions and the plan can be put in the real situation.						
2. You are informed IEC program plan to your colleagues.						

Statement	Level of self-efficacy			Level of practice		
	High	Moderate	Low	Able	Unsure	Unable
3. You have informed and coordinated IEC plan with other units.						
4. You organized IEC program in according to IEC package.						
5. You can disseminate IEC regarding vivax malaria in malaria clinic through various media effectively.						
6. You give suggestion and follow up IEC guideline organized for vivax malaria patients in malaria clinic continuously and coveragely in according to IEC program.						
7. You evaluate IEC program e.g. defining indicators for changing drug taking behavior of vivax malaria patients in malaria clinics.						
8. You use the result of evaluation in developing IEC program for vivax malaria patients in malaria clinics.						
<b>Structure of IEC program</b>						
1. You have skills in implementing IEC program in malaria clinics.						
2. You take responsibility according to your roles.						
3. You have developed yourself in order to develop IEC program to vivax malaria patients for continuous high quality.						
4. You participated in setting implementation plan and guideline of media and material objectives for improving drug adherence to vivax malaria patients.						
5. You develop an IEC plan for using with vivax malaria patients						
6. You could select necessary media and material for organizing IEC Program in malaria clinic effectively.						
7. You have provided necessary media and material for organizing IEC Program in malaria clinic regarding to adequacy and maintenance to be ready to use.						
8. You have established the environment conductive to IEC program e.g. the available room/area for organizing IEC program, providing convenience, available material and facility such as information corner.						
9. You act as a good role model in implementing quality IEC program in malaria clinics						

**PART 4: Job satisfaction of malaria officers in implementing according of IEC program**

**Instruction:** Kindly read each of the following statement and check ✓ in one of three choices provided that mostly reflect your feeling of satisfaction.

Statement	Level of satisfaction		
	High	Moderate	Low
<b>Professional work</b>			
1. Involve in IEC program planning/project of health service			
2. Opportunity for developing health education skills is available			
3. Organizing structure is appropriate and supportive IEC program to vivax malaria patient			
4. You have been accepted by your colleague			
5. You have got opportunities for career development			
<b>Autonomy</b>			
1. You are free to make decisions regarding health education service			
2. You could modify health education services suitable for patient's need			
3. Providing IEC program promoted you to utilize your knowledge and ability to work freely			
4. You could make reasonable decisions freely			
<b>Work worth</b>			
1. Your work is useful for malaria control program			
2. IEC program is worth for your job			
3. IEC promotes you and you feel that you are accomplished			
4. Implement IEC program prides your responsibility			
<b>Within/between professional relationship</b>			
1. You have got relationship with your colleagues in providing IEC program			
2. You have got support from your colleagues in making decision about IEC program			
3. Teamwork and collaboration among different people are good			
4. Your work achievement has been praised by your colleagues			
5. You have a good relationship with your supervisors/ administrators in providing IEC program			
<b>Role enactment</b>			
1. You have enough time for providing IEC program to vivax malaria patients			
2. You have enough time to pay attention to and participate in carrying out a research project			
3. You have a chance to exchange opinions with your colleagues and show opinions in your work			

**APPENDIX A****Evaluate the participatory training program in organizing the workshop on IEC training program for health promoting to vivax malaria patients in malaria clinics**

**Instructions:** Kindly read each of the following statement and check ✓ in one of three choices provided that mostly reflect your feeling of satisfaction.

<b>Statement</b>	<b>High</b>	<b>Moderate</b>	<b>Low</b>
1. Every activities organized is useful for your health service			
2. The time allotment for each activity was appropriate			
3. Every resource person was appropriate			
4. The time allotment for the whole program was appropriate			
5. You have got chance to exchange opinion/experience among the participants			
6. You are participated in all activities organized			
7. Being participated in the activities organized help you discover your own ability			
8. Being participated in the activities organized help you know and understand each others			
9. You have understood more about the role of health education in the malaria clinics			
10. You could apply experience learned in implementing IEC program in the malaria clinics			
11. You are confident to organize IEC program to improve drug taking behavior of vivax malaria patients			
12. You could be able to coordinate, persuade, and encourage vivax malaria patients to participate in complete their drug prescriptions			
13. You are ready to organize IEC program in the malaria clinics			

## APPENDIX A QUESTIONNAIRE SET 3

This set of questionnaire is for interview with vivax malaria patients. There are 6 parts as follows;

Part 1: General information

Part 2: General knowledge on malaria

Part 3: Perception of malaria treatment

Part 4: Self-efficacy regarding drug taking behaviors

Part 5: Accessing information on malaria prescriptions

Part 6: Patients' satisfaction with the IEC program and health services at the malaria clinic

### **PART I: General Information**

**Instructions:** Please check ✓ in ( ) or fill in .....

1. Age of respondent.....years old.
2. Gender ( ) 1. Male ( ) 2. Female
3. Marital status ( ) 1. Single ( ) 2. Married ( ) 3. Widowed/Divorced/Separated
4. Ethnicity ( ) 1. Thai ( ) 2. Tai Yai ( ) 3. Karen ( ) 4. Other (please specify).....
5. Educational level
 

( ) 1. No attain school	( ) 2. Primary school
( ) 3. Secondary school	( ) 4. Vocational school
( ) 5. Bachelor's degree or higher	( ) 6. Other (please specify).....
6. The ability of your language
 

Speaking ( ) 1. Thai ( ) 2. Karen ( ) 3. Tai Yai ( ) 4. Burmese ( ) 5. Other....
Writing ( ) 1. Thai ( ) 2. Karen ( ) 3. Tai Yai ( ) 4. Burmese ( ) 5. Other ....
7. Your occupation
 

( ) 1. Unemployed (Children/student/housewife)	( ) 2. Wage employee
( ) 3. Business/trader/merchant	( ) 4. Government/Private enterprise
( ) 5. Farmer/agriculturist/fruit orchard	( ) 6. Forest related
( ) 7. Other (please specify).....	
8. Your average income per month ..... Baht (Only income of the respondent)
9. Number of your family members.... persons (Only persons who are living in your house)

**PART II: General Knowledge of Malaria**

**Instructions:** Please check ✓ in the ( ) or fill in ..... according to the respondent's answer.

1. How is malaria transmitted?

- 1.1 By mosquito biting ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 1.2 By drinking water containing mosquito larvae ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 1.3 By drinking raw stream water in the forest ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 1.4 Because of a supernatural force ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 1.5 Do not know ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 1.6 Other (specify).....

2. Where are breeding places of malaria mosquitoes?

- 2.1 Slow running streams ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 2.2 Animal footprints ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 2.3 Do not know ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 2.4 Other (specify) .....

3. What is/are method (s) to protect against mosquito bites? (Can be more than one answer)

- 3.1 Sleeping under a mosquito net ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.2 Sleeping under an impregnated mosquito net ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.3 Spraying house with chemical ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.4 Wear long clothing ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.5 Apply mosquito repellent ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.6 Grow lemongrass around house ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.7 Light mosquito coils ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.8 Keep a fire smoking ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.9 Drive mosquitoes away with electric fan ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 3.10 Other (specify).....

4. What are symptoms of malaria? (Can be more than one answer)

- 4.1 Headaches ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 4.2 Fever ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 4.3 Shivering ( ) 1. No ( ) 2. Yes ( ) 3. Unsure
- 4.4 Sweating ( ) 1. No ( ) 2. Yes ( ) 3. Unsure

- 4.5 Muscular pain                   ( ) 1. No      ( ) 2. Yes      ( ) 3. Unsure
- 4.6 Nausea/vomit                   ( ) 1. No      ( ) 2. Yes      ( ) 3. Unsure
- 4.7 Anemia                           ( ) 1. No      ( ) 2. Yes      ( ) 3. Unsure
- 4.8 Convulsion                   ( ) 1. No      ( ) 2. Yes      ( ) 3. Unsure
- 4.9 No signs or symptoms       ( ) 1. No      ( ) 2. Yes      ( ) 3. Unsure
- 4.10 Other (please specify) .....
5. Since January 2005, how many times have you got malaria? .....times.
6. When was the last time you have malaria? .....day/month/year.
7. At the time you got malaria;
- 7.1 Who took you to the malaria clinic?
- ( ) 1. By myself      ( ) 2. Others (please specify).....
- 7.2 Who took care of you and gave you the anti-malarial drugs at home?
- ( ) 1. Myself      ( ) 2. Others (please specify).....
8. Did the malaria officer tell you about the type of malaria you were infected?
- ( ) 1. Yes, but do not remember      ( ) 2. No, I was not told
- ( ) 3. Yes, Pf      ( ) 4. Yes, Pv      ( ) 5. Other (please specify).....

### **PART III: Perception of malaria and malaria treatment**

**Instructions:** Please check ✓ one of the choices provided according to the respondent's choice for each statement.

Statements	Agreed	Unsure	Disagreed
1. Everyone has an equal chance to get malaria.			
2. Only vulnerable persons can get infected from malaria.			
3. Staying overnight in the forest puts one at risk for malaria contraction.			
4. You should go straight to the malaria clinic immediately to have your blood checked if you feel sick.			
5. Malaria patients are unable to work when they are sick.			
6. You should take time off from work to go to malaria clinic for treatment.			
7. If needed to be cure, you must take all of the provided drugs.			
8. You will not get relapsing malaria if you complete taking drugs.			
9. Death may occur if a person has inappropriate treatment for malaria.			
10. Malaria patients can be re-infected if they did not complete medicine.			

**PART IV: Self-efficacy regarding drug taking behaviors.**

**Instruction:** Please check ✓ in one of the choices provide accordingly with the patient’s choice for each statement.

Statement	Level of self-efficacy		
	Can do it	Unsure	Can not do it
1. You are confident with anti malarial drug treatment at malaria clinic.			
2. You can take anti-malarial drug regularly in accordance with prescribed doses.			
3. You are able to take anti-malarial drugs regularly on time as prescribed by malaria clinic.			
4. You can adhere to treatment because you do not want malaria relapses.			
5. You can be able to follow antimalarial drug prescription.			
6. You will not stop taking anti-malarial drugs if having side effects after start taking.			
7. You are able to tell the side effect of antimalarial drug.			
8. You forget to take drugs, you will retake it immediately.			
9. You are abide by every follow up appointment from the clinic.			
10. You will consult your close friend/person e.g. family member, relative, neighbor, etc.			
11. You are able to keep antimalarial drug safely.			
12. You are able to protect your self from mosquito bite during taking medicine.			
13. You are confident to tell the other vivax malaria how to take the antimalarial drug.			
14. If you forget to take drug, you are able to retake it immediately.			
15. You are confident in antimalarial prescription from malaria clinic.			

**PART V: Accessing to information on malaria medications**

**Instructions:** Please check ✓ in the ( ) or fill in .....according to the patient’s answer

1. How long did you to take anti-malarial pills to treat your malaria?  
 ( ) 1. Do not remember ( ) 2. 14 Days ( ) 3. Other (please specify) ..... Days
2. Do you remember the colors and pills that you received from the malaria clinic?  
 ( ) 1. No  
 ( ) 2. Yes, how many tablets did you get and what were the colors of the drugs?  
 ( ) 2.1 White colors, how many?.....Tablets/ Or how many days? .....Days  
 ( ) 2.2 Brown/black, how many?.....Tablets/ Or how many days? .....Days

3. What type of drug package did you receive from malaria clinic?
- 1. Do not remember
  - 2. One plastic bag (mix of Chloroquine and Primaquine)
  - 3. Two plastic bags (one containing Chloroquine and one containing Primaquine)
  - 4. Three plastic bags (Chloroquine, Primaquine and Paracetamol)
  - 5. More than 3 plastic bags (plastic bags divided according to meals)
  - 6. Other (please specify) .....
4. Did you take your first tablets at the malaria clinic immediately after you received them?
- 1. No
  - 2. Yes
  - 3. No, I firstly started at home
  - 4. Other (please specify).....
5. Did you clearly understand the drug label and instructions? Were the instructions easy or difficult to follow? Why?
- 1. Illiterate .....
  - 2. Not clear, because .....
  - 3. Clear
  - 4. Other (please specify) .....
6. Did the malaria clinic officer clearly explain to you to complete the drugs when providing instructions?
- 1. Did not explain (go to No.8)
  - 2. Do not remember (go to No.8)
  - 3. Yes, he/she prescribed to take drugs from each separate bag and take the remaining each tablet a day.
  - 4. Yes, he/she explained to take drugs daily as prescribed on each bag.
  - 5. Other (please specify) .....
7. Did you understand all of the details?
- 1. No
  - 2. Yes
  - 3. Do not remember
  - 4. Other (please specify) .....

8. Please show me how you took the medicine each day? **(Do not lead answers)**  
**(Interviewer gives a set of anti-malarial drugs to the patient and allows him/her to show how they took the drugs each meal or each day)**

Day	Details	Take drug		Day	Details	Take drug	
		X	✓			X	✓
1	1 <sup>st</sup> meal			7.			
	2 <sup>nd</sup> meal			8.			
	3 <sup>rd</sup> meal			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			

9. Did you take the drugs correctly each day?  
 1. Yes       2. Sometimes       3. No       4. Not sure/ Do not remember
10. Did you take the drugs on time every day?  
 1. Yes       2. Sometimes       3. No       4. Not sure/ Do not remember
11. Did you take the drugs every meal that you were given?  
 1. Yes       2. Take some meals       3. Not at all       4. Not sure/ Do not remember
12. Did you continue to complete drugs even after you felt better?  
 1. No (go to No.14)       2. Yes, but irregularly       3. Yes, took them all
13. Which colors of the drugs did you not finish? Why?  
 13.1 White       1. Finished all (go to No. 15)       2. Did not finish  
 13.2 Brown/black       1. Finished all (go to No. 15)       2. Did not finish
14. If you did not complete all of the drugs, where did you keep the remaining pills?  
 1. At home       2. Threw them away(       3. Other (please specify).....
15. What were the side effects, if any, of taking anti-malarial drugs?  
 (please check all that apply)  
 1. Nothing       2. Nausea/vomiting/dizziness       3. Abdominal pain/diarrhea  
 4. Changing color of urine       5. Other (please specify) .....

16. Did you observe the color of your urine while taking anti-malarial drugs?

- 1. No
- 2. Yes, what was the color of your urine? (please specify)
  - 1. Dark yellow                       2. Brown
  - 3. Red                                       4. Other (please specify).....

17. Did you return for your appointment at the malaria clinic to follow up on your blood examination?

- 1. No (go to No. 19)     2. Yes
- 3. Rescheduled for another date/time due to .....

18. Regarding the blood results from your follow-up visit to the malaria clinic, were you continuously prescribed different anti-malarial drugs?

- 1. No, blood result was negative
- 2. Yes, because blood result showed that you had:
  - 2.1 Pf                       2.2 Pv                       2.3 Other (please specify).....

19. Could you provide ideas on how anti-malarial drugs could be better packaged in order to make it easier for you to take them?

- 1. Assemble all pills in one plastic bag
- 2. Divide all of the pills according to each meal
- 3. Provide pills in a plastic and foil pop-out sheet
- 4. No need to change the packaging
- 5. Other (please specify) .....

**Part 6** Patients’ satisfaction toward health care service from malaria clinics

**Instruction:** Please check ✓ in one of the choices provide accordingly with the patient’s satisfaction.

Statement	Level of satisfaction		
	High	moderate	Low
<b>Convenience</b>			
1. Malaria clinic is located in the city/village that is convenience to access.			
2. The speed of providing services of blood checking.			
3. Adequate of seats while waiting.			
4. Availability of disseminating information about malaria			
5. Availability of providing information on anti-malarial drug prescriptions.			
6. Availability of health related information corner e.g. IEC materials.			

Statement	Level of satisfaction		
	High	moderate	Low
7. Area for organizing IEC activities is privacy, convenient, and safe.			
<b>Information received</b>			
1. Malaria officer pay attention to the information about your illness that you report to them			
2. Information about vivax malaria treatment from IEC package are useful			
3. Suggestion about self-care behaviors for controlling malaria that you received from the malaria officers.			
4. Explanation about medicine taking that you received from malaria officer.			
5. Answers of the questions that you have asked malaria staff.			
6. You could be able to apply knowledge that you receive from malaria staff to adhere your treatment			
7. You could be able to apply knowledge that you receive from malaria staff transfer to other vivax malaria patients			
8. Appropriate time allotment of receiving IEC package			
<b>Coordination of services</b>			
1. The malaria health services are convenient, quick, and with simple steps.			
2. Malaria officer can be able to encourage patients in accordance with your need.			
3. The IEC program should be provided to all vivax malaria patients			
4. The transferring program of IEC to vivax malaria patients is effective			
<b>Quality of care</b>			
1. Trust with malaria officers.			
2. Malaria officer's competence in performing good IEC for you.			
3. Malaria officer's competence in using IEC materials.			
4. You enjoy with IEC materials that are friendly.			
5. Readiness and modernity of IEC materials.			
6. You can understand all of IEC materials that guide you to complete anti-malarial drugs.			
7. You received quality medicine from malaria clinic.			
8. The overall quality of the service received.			

**Part VII: Problems, barriers and suggestions regarding how to encourage vivax malaria patients to comply with a given treatment regimen (please specify)**

.....  
 .....  
 .....

**APPENDIX A**  
**GUIDELINE OF THE FOCUS GROUP DISCUSSION**  
**WITH MALARIA OFFICERS**

1. Introduce ourselves and let our staff know about the objective of the focus group discussion and state time for discussion for one hour.
2. How do you do when the malaria patients come to visit your malaria clinic?
3. What is the treatment of vivax malaria?  
Do you know the side effects of anti-malarial drug?  
What do you do if the vivax patients have side effect of anti-malarial drug?
4. How do you make sure that the patients will take your medicine prescription correctly?
5. What is going on health education for vivax malaria patients in malaria clinic?
6. What do you feel when you have been assigned to be responsible for going on health education for malaria patient in the malaria clinic?
7. What do you think about the work of health education for malaria patient in malaria clinic?
8. What have you done about health education for vivax malaria patient in your clinic?
9. How did you feel about health education activities for vivax malaria patient in your clinic?
10. What do you think about vivax patient's feeling about health education when you have given anti-malarial drugs for them?
11. How and what should be done to develop health education in malaria clinic for improving adherence to anti-malaria drugs among vivax malaria patients?
12. What do you think about health education activities provided by malaria staff of the Vector Borne Disease Unit?
13. What do you think the Office of Disease Prevention and Control No.10 should support health education activities and how?
14. What kind of support that you think the Vector Borne Disease Section should provide for your health education in malaria clinic?

**APPENDIX A**  
**GUIDELINE FOR THE FOCUS GROUP DISCUSSION**  
**WITH VIVAX MALARIA PATIENTS**

1. How did you know that you got malaria?
2. How did you feel when you know that you got malaria?
3. Why did you decide to visit malaria clinic?
4. How did you believe about malaria treatment in malaria clinic?
5. Do you think that vivax malaria can be cured? If not, what are the reasons?
6. What are the kinds of the problems and obstacles in taking anti-malaria drugs?  
How did you solve this problem?
7. What do you think about incorrect behavior of taking antimalarial drugs? How do you do you changed that behaviors? Why?
8. What kinds of support did your family provide you? What do you think your family should help you or care for you?
9. What do you think the health volunteer, malaria officer, and health care providers in the community should do for the vivax patients?

## APPENDIX B

### COURSE MAP OF EMPOWERMENT TRAINING PROGRAM

#### Unit 1: Basic Skills

General Objective: At the end of this unit participants will be able to apply team building, critical thinking and problem solving for malaria control.

Topic	Specific objective	Content	Activities	Materials	Evaluation	Time
1 Team building	-Identify the characteristics of good team work	-Characteristics of good team work	-Small group exercise(4-5) on broken square game -Feed back from group on previous activity -Small group Discussion (same)on good team work -Presentation from flip chart & feed back	-Flip chart -Marker pen -Cut paper (different shape that can be matched in A4 size)	-Observation -Questioning and answering -Presentation -Pre-post test	1 hr
	-Identify characteristics of effective leader	-The characteristics of effective leader	-Small group discussion -Presentation from flip chart & feedback -Lecture	-Handouts 17 copies -LCD/Computer -4 Flip charts -Marker pen	-Observation during class	1 hr
	-Discuss the advantages of working as a team	-Advantages of working as a team	-small group Discussion (same) on advantages of working as a team -Presentation from flip chart & feedback	-Handouts 17 copies -LCD/Computer -4 Flip charts -Marker pen	-Observation -Questioning and answering -Presentation	1 hr

## Unit 2 Refreshed training on Malaria Diagnosis and Treatment

General Objective: At the end of this unit participants will be able to recall malaria diagnosis and treatment of national guidelines

Topic	Specific objective	Content	Activities	Materials	Evaluation	Time
1. Malaria diagnosis	-Identify the malaria species on thick blood film under microscope	-The diagnosis point of Plasmodium species	-Small group discussion -Lecture -Practice of malaria diagnosis form unknown sample	-Handout 17 copies -Computer & LCD -Flip chart -Marker pen	-Observation -Questioning and answering -Presentation	1 hr
2. Malaria treatment	-List the name of drug used for malaria treatment -Demonstrate treatment malaria patient	-Anti-malarial drug used for treatment -Using the guideline for treatment -Side effect of anti-malarial drug	-Small group discussion -Lecture -Case study -Demonstrate	- Handouts 17 copies - LCD/ Computer - Flip chart - Marker pen	-Observation during class -Demonstrate for case study	1 hr

## Unit 3: Conduct malaria surveillance

General Objective: At the end of this unit participants will be able to utilize epidemiological approach for malaria control

Topic	Specific objective	Content	Activities	Materials	Evaluation	Time
1. Basic of epidemiology of malaria	-Describe epidemiology of malaria	-Epidemiology of malaria the relationship of malaria parasite, vector and human	-Brainstorming -Lecture -Exercise (individual and group discussion) -Presentation	-LCD/Computer -Handouts 17copies -Manual on malaria control in Thailand	-Presentation -Observation	½ hr
2. Malaria surveillance	-Discuss the malaria surveillance system	-Area stratification	-Lecture -Exercise (individual and group discussion) -Presentation	-LCD/Computer -Handouts 17 copies	-Presentation -Observation	½ hr
		-Case identification	-Lecture -Exercise (individual and group discussion) -Presentation	-LCD/Computer -Handouts 17 copies	-Presentation -Observation	½ hr

Topic	Specific objective	Content	Activities	Materials	Evaluation	Time
		-Case investigation	-Lecture -Exercise (individual and group discussion) -Presentation	-LCD/Computer -Handouts 17 copies	-Presentation -Observation	½ hr
		-Case reporting	-Lecture -Exercise (individual and group discussion) -Presentation	-OHP -Transparency -Marker pen -Handouts 17 copies	-Presentation -Observation	½ hr
3.Applied field study	-Analyze local malaria situation	-Data collection -Data analysis	-Lecture -Group discussion -Presentation	-LCD/Computer -Handouts 17 copies	- Questioning and answering -Observation	½ hr
	-Identify problem on vivax malaria using evidence based approach	-Problem identification using evidence based approach	-Lecture -Group discussion -Presentation	-LCD/Computer -Handouts 17 copies	-Presentation -Observation	1 hr
	-Discussion appropriate recommendation to address vivax malaria problem based on situation analysis	-Formulation of recommendation to address vivax malaria problem	-Lecture -Group discussion -Presentation	-Handouts 18 copies -Report forms	-Presentation -Observation	2 hrs

#### Unit 4: Developed and applied IEC program to their malaria clinics

General objective: At the end of this unit participants will be able to apply IEC to their community and malaria clinics

Topic	Specific objective	Contents	Activities	Materials	Evaluation	Time
1. Participation in IEC	-Describe the basic need of human	-Basic needs	-Lecture -Small group exercise -Presentation	-Handout 17 copies -LCD/Computer -Flip chart -Marker pen	-Questioning/ answering -Presentation -Observation	1 hr
	-Recall the learning theory	-Learning theory	-Lecture -Small group exercise -Presentation group work	- Handouts 17 copies LCD/ Computer - Flip chart - Marker pen	-Questioning/ answering -Presentation -Observation	2 hrs

<b>Topic</b>	<b>Specific objective</b>	<b>Contents</b>	<b>Activities</b>	<b>Materials</b>	<b>Evaluation</b>	<b>Time</b>
	-Demonstrate the interpersonal communication	-Interpersonal communication	-Lecture -Small group exercise -Presentation	-Handouts 17 copies -LCD/Computer -Flip chart -Marker pen	-Questioning/answering -Presentation -Observation	2 hrs
	-List IEC materials	-Type of IEC materials	-Games -Whole class discussion -Lecture	-Handouts 17copies -LCD/Computer -Flip chart -Marker pen	-Questioning/answering -Presentation -Observation	2 hrs
	-Apply the technique of communication to vivax malaria patients	-Communication skills	-Lecture -Small group exercise -Group work -Presentation	-Handouts 17copies -LCD/Computer -Flip chart -Marker pen	-Questioning/answering -Presentation -Observation	2 hrs
	-Select an appropriate IEC and IEC materials for vivax malaria patients	-Application of IEC and IEC friendly tailored materials and guidelines in malaria clinics	-Lecture -Small group exercise -Presentation	-Handouts 17 copies -LCD/Computer -Flip chart -Marker pen	-Questioning/answering -Presentation -Observation	2 hrs
	-Planning IEC for vivax malaria patients in malaria clinics	-Health education	-Whole class discussion -Lecture	- Handouts 18 copies - LCD/Computer - Flip chart - Marker pen	-Questioning/answering -Presentation -Observation	2 hrs

**APPENDIX C**  
**INFORMATION, EDUCATION, AND COMMUNICATION (IEC)**  
**TAILORED MATERIALS**

## ขั้นตอนการให้บริการสำหรับผู้ป่วยมาลาเรียไวกเวซ

เมื่อผู้ป่วยมารับการตรวจเลือด เจ้าหน้าที่ซักถามอาการ ประวัติการเจ็บป่วย/การแพ้ยา และการตั้งครรภ์

เจาะเลือดจากปลายนิ้วตรวจหาเชื้อมาลาเรีย



← รอประมาณ 30 นาที

พบเชื้อมาลาเรียไวกเวซ



ผู้ป่วยรับทราบโครงการให้สุขศึกษากับผู้ป่วยมาลาเรียไวกเวซ และยินยอมเข้าร่วมโครงการฯ



ผู้ป่วยเซ็นยินยอมเข้าร่วมโครงการฯ และให้สัมภาษณ์ตามแบบฟอร์มฯ ครั้งที่ 1 (20 นาที)



ให้โปรแกรมสุขศึกษาและจ่ายยาตามมาตรฐานการรักษา (20 นาที)



ผู้ป่วยกลับบ้าน



ผู้ป่วยกลับมาตรวจตามนัดในวันที่ 15 หลังจากกินยาวันแรก เพื่อเจาะเลือดจากปลายนิ้วตรวจหาเชื้อมาลาเรีย



← รอประมาณ 30 นาที

ผู้ป่วยให้สัมภาษณ์ตามแบบฟอร์มฯ ครั้งที่ 2 (30 นาที)



แจ้งผลการตรวจเลือดให้ผู้ป่วยทราบ

POSTER

**เชื้อมาลาเรียโวกแวกซ์ (พีวี) กับ การกินยาอย่างไรให้ได้ผล**

**มุ่งกันปด่อง นำเชื้อมาลาเรีย**

**วิธีกินยาฆ่าเชื้อพีวี สำหรับผู้ป่วยอายุ 3-7 ปี**

เริ่มกินยา: วันที่ 1, 2, 3 (เม็ดสีขาว) → วันที่ 2, 3 (เม็ดสีขาว) → วันที่ 4-14 (เม็ดสีดำ)

กินยาตามวัน ให้ครบ 14 วันตามลูกศรชี้ แล้วกลับไปตรวจตามนัด

มาลาเรียโวกแวกซ์ ฆ่าเชื้อโวกแวกซ์ กินยาครบ 14 วันทันใด

ป่วยได้ เสร็จฟื้น พยาธิยัง ค่อยๆหายหมอให้ ให้รีบไป ตรวจซ้ำอีกที

ผลิตโดย สำนักงานป้องกันควบคุมโรคที่ 10 และคณะราชศาสตร์รณรงค์ มหาวิทยาลัยมหิดล สนับสนุนโดย โครงการวิจัยสุขภาพกาญจนบุรีภาค

**เชื้อมาลาเรียโวกแวกซ์ (พีวี) กับ การกินยาอย่างไรให้ได้ผล**

**มุ่งกันปด่อง นำเชื้อมาลาเรีย**

**วิธีกินยาฆ่าเชื้อพีวี สำหรับผู้ป่วยอายุ 8-13 ปี**

เริ่มกินยา: วันที่ 1, 2, 3 (เม็ดสีขาว) → วันที่ 2, 3 (เม็ดสีขาว) → วันที่ 4-14 (เม็ดสีดำ)

กินยาตามวัน ให้ครบ 14 วันตามลูกศรชี้ แล้วกลับไปตรวจตามนัด

มาลาเรียโวกแวกซ์ ฆ่าเชื้อโวกแวกซ์ กินยาครบ 14 วันทันใด

ป่วยได้ เสร็จฟื้น พยาธิยัง ค่อยๆหายหมอให้ ให้รีบไป ตรวจซ้ำอีกที

ผลิตโดย สำนักงานป้องกันควบคุมโรคที่ 10 และคณะราชศาสตร์รณรงค์ มหาวิทยาลัยมหิดล สนับสนุนโดย โครงการวิจัยสุขภาพกาญจนบุรีภาค

**เชื้อมาลาเรียโวกแวกซ์ (พีวี) กับ การกินยาอย่างไรให้ได้ผล**

**มุ่งกันปด่อง นำเชื้อมาลาเรีย**

**วิธีกินยาฆ่าเชื้อพีวี สำหรับผู้ป่วยอายุมากกว่า 14 ปีขึ้นไป**

เริ่มกินยา: วันที่ 1, 2, 3 (เม็ดสีขาว) → วันที่ 2, 3 (เม็ดสีขาว) → วันที่ 4-14 (เม็ดสีดำ)

กินยาตามวัน ให้ครบ 14 วันตามลูกศรชี้ แล้วกลับไปตรวจตามนัด

มาลาเรียโวกแวกซ์ ฆ่าเชื้อโวกแวกซ์ กินยาครบ 14 วันทันใด

ป่วยได้ เสร็จฟื้น พยาธิยัง ค่อยๆหายหมอให้ ให้รีบไป ตรวจซ้ำอีกที

ผลิตโดย สำนักงานป้องกันควบคุมโรคที่ 10 และคณะราชศาสตร์รณรงค์ มหาวิทยาลัยมหิดล สนับสนุนโดย โครงการวิจัยสุขภาพกาญจนบุรีภาค

## PAMPHLETS

### การกินยารักษามาลาเรียไวแวกซ์

เมื่อป่วยเป็นมาลาเรียไวแวกซ์ ท่านจะได้รับยา 2 ชนิด คือ เม็ดสีขาว และเม็ดสีน้ำตาล ให้ท่านกินยาตามวันที่ครบ ตามลูกศรชี้ เริ่มจากวันที่ 1 จนครบ 14 วัน แล้วให้กลับไปตรวจตามนัดทุกครั้ง เพื่อแน่ใจว่าไม่มีเชื้อมาลาเรียในเลือดแล้ว

### อาการข้างเคียงของยา

ที่พบบ่อยคือคลื่นไส้ อาเจียน เวียนศีรษะ ดังนั้น ควรกินยาล้างอาหารทันที หรือดื่มน้ำก่อนให้มากๆ แล้วกินยาตาม เพื่อไม่ให้ท้องว่าง

### ข้อควรระวัง

1. ควรกินยาตามที่เจ้าหน้าที่กำหนด ทุกครั้งจนครบ
2. ถาลิมกินยาเมื่อใดให้กินทันทีเมื่อนึกขึ้นได้และห้ามนํายา 2 มือมากินพร้อมกัน
3. ห้ามแบ่งยาของคนไปให้ผู้อื่นกิน
4. ถ้าบัสสวาระเคมมีสีดำ ต้องแจ้งเจ้าหน้าที่ทราบ

มาลาเรียโรคร้าย ป่วยได้ เรื้อรัง มาลาเรียไวแวกซ์ ทุยคั้ง ด้วยยาหมอให้กินยาครบ 14 วันทันที ให้นำไป ตรวจซ้ำอีกที

### คู่มือการกินยา รักษามาลาเรียไวแวกซ์ สำหรับผู้ป่วย อายุ 3 - 7 ปี

สำนักงานป้องกันควบคุมโรคที่ 10 ร่วมกับ คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล สนับสนุนโดยโครงการปริญญาดอกกาญจนาภิเษก

### มาลาเรียไวแวกซ์ คืออะไร ?

โรคติดต่อที่เกิดจากยุงก้นปล่องกัดคนที่มเชื้อมาลาเรีย (ผู้ป่วย) ทำให้เชื้อเข้าไปอยู่ในตัวยุงแล้วยุงที่มีเชื้อไปกัดคนที่มสุขภาพแข็งแรงคนนั้นก็จะเป็นไข้มาลาเรีย

เมื่อผู้ป่วยได้รับเชื้อมาลาเรียไวแวกซ์ เชื้อนี้ก็จะออกมาสู่กระแสเลือดในร่างกาย แล้วเราก็จะมีอาการเจ็บป่วย

ปวดศีรษะ

เป็นไข้หนาวสั่น

อ่อนเพลียง

### จะอย่างไรเมื่อมีอาการป่วย

รีบไปเจาะเลือดที่ปลายนิ้วตรวจหาเชื้อมาลาเรียที่มาลาเรียคลินิกหรือสถานบริการสาธารณสุขใกล้บ้าน

## PAMPHLETS

### การกินยารักษามาลาเรียไวเวกซ์



เมื่อป่วยเป็นมาลาเรียไวเวกซ์ ท่านจะได้รับยา 2 ชนิด คือ เม็ดสีขาว และเม็ดสีน้ำตาล ให้ท่านกินยาตามวันโตครบ ตามลูกศรชี้ เริ่มจากวันที่ 1 จนครบ 14 วัน แล้วให้กลับไปตรวจตามนัดทุกครั้ง เพื่อแน่ใจว่าไม่มีเชื้อมาลาเรียในเลือดแล้ว

### ข้อควรระวัง

1. ควรกินยาตามที่เจ้าหน้าที่กำหนด ทุกครั้งจนครบ
2. ถ้าลืมกินยาเมื่อใดให้กินทันทีเมื่อนึกขึ้นได้และห้ามนำยา 2 มื้อมากินพร้อมกัน
3. ห้ามแบ่งยาของคนไปให้ผู้อื่นกิน
4. ถ้าปัสสาวะเคยมีสีดํา ต้องแจ้งเจ้าหน้าที่ทราบ

### คู่มือการกินยา รักษามาลาเรียไวเวกซ์ สำหรับผู้ป่วย อายุ 8 - 13 ปี



สำนักงานป้องกันควบคุมโรคที่ 10 ร่วมกับ คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล  
สนับสนุนโดยโครงการวิจัยอนุเอกาณูจนาภิเษก

### อาการข้างเคียงของยา

ที่พบบ่อยคือคลื่นไส้ อาเจียน เวียนศีรษะ ดังนั้น ควรกินยาหลังอาหารทันที หรือดื่มน้ำก่อนให้มากกว่า แล้วกินยาตาม เพื่อไม่ให้ท้องว่าง



มาลาเรียโรคร้าย  
มาลาเรียไวเวกซ์  
กินยาครบ 14 วันทันที

ป่วยได้ เรื่อง  
หนักยิ่ง ด้วยยาหมอให้  
ให้รีบไป ตรวจซ้ำอีกที

## มาลาเรียไวเวกซ์ คืออะไร ?



โรคติดต่อที่เกิดจากยุงก้นปล่องกัดคนที่มียุงมาลาเรีย (ผู้ป่วย) ทำให้เชื้อเข้าไปอยู่ในตัวยุงแล้วยุงที่มีเชื้อไปกัดคนที่มียุงสุขภาพแข็งแรงคนนั้นก็ป่วยเป็นไข้มาลาเรีย

เมื่อผู้ป่วยได้รับเชื้อมาลาเรียไวเวกซ์ เชื้อนี้จะออกมาสู่กระแสเลือดในร่างกาย แล้วเราก็มีอาการเจ็บป่วย






## จะอย่างไร เมื่อมีอาการป่วย

รีบไปเจาะเลือดที่ปลายนิ้วตรวจหาเชื้อมาลาเรียที่มาลาเรียคลินิกหรือสถานบริการสาธารณสุขใกล้บ้าน




## PAMPHLETS

### การกินยารักษามาลาเรียไวเวกซ์



เมื่อป่วยเป็นมาลาเรียไวเวกซ์ ท่านจะได้รับยา 2 ชนิด คือ เม็ดสีขาว กับเม็ดสีน้ำตาล (ตามรูป)

### อาการข้างเคียงของยา

ที่พบบ่อยคือคลื่นไส้ อาเจียน เวียนศีรษะ ดังนั้น ควรกินยาหลังอาหารทันที หรือดื่มน้ำก่อนให้มากๆ แล้วกินยาตาม เพื่อไม่ให้ท้องว่าง



### ข้อควรระวัง

- ควรกินยาตามที่เจ้าหน้าที่กำหนดทุกครั้ง จนครบ
- ถ้าลืมกินยาเมื่อใดให้กินทันทีเมื่อนึกขึ้นได้ และห้ามนำยา 2 มื้อมากินพร้อมกัน
- ห้ามแบ่งยาของคนไปให้ผู้อื่นกิน
- ถ้าบัสสาวะเคยมีสีดำ ต้องแจ้งเจ้าหน้าที่ทราบ
- ถ้าสงสัยว่าตั้งครรภ์ต้องแจ้งให้เจ้าหน้าที่ทราบ



มาลาเรียโครราย      ป่วยได้ เรื้อรัง  
มาลาเรียไวเวกซ์      หยุดยั้ง ด้วยยาหมอให้  
กินยาครบ 14 วันทันที      ให้รับไป ตรวจซ้ำอีกที

### คู่มือการกินยา รักษามาลาเรียไวเวกซ์ สำหรับผู้ป่วย อายุมากกว่า 14 ปีขึ้นไป



สำนักงานป้องกันควบคุมโรคที่ 10 ร่วมกับ คณะเวชศาสตร์เขตร้อน มหาวิทยาลัยมหิดล สนับสนุนโดยโครงการปริญญาเอกกาญจนาภิเษก

### มาลาเรียไวเวกซ์ คืออะไร ?



โรคติดต่อที่เกิดจากยุงก้นปล่องกัดคนที่มียุงมาลาเรีย (ผู้ป่วย) ทำให้เชื้อเข้าไปอยู่ในตัวยุงแล้วยุงที่มีเชื้อไปกัดคนที่มียุงสุขภาพแข็งแรงคนนั้นก็ป่วยเป็นไข้มาลาเรีย

เมื่อผู้ป่วยได้รับเชื้อมาลาเรียไวเวกซ์ เชื้อนี้ก็จะออกมาสู่กระแสเลือดในร่างกาย แล้วเราก็จะมีอาการเจ็บป่วย




ปวดศีรษะ



เป็นไข้หนาวสั่น



อ่อนเพลียง

### จะอย่างไร เมื่อมีอาการป่วย

รีบไปเจาะเลือดที่ปลายนิ้วตรวจหาเชื้อมาลาเรียที่มาลาเรียคลินิกหรือสถานบริการสาธารณสุขใกล้บ้าน








## FLIPCHART



มาลาเรียเป็นโรคติดต่อที่นำโดยยุงก้นปล่อง ซึ่งยุงก้นปล่องนี้จะออกหากินในเวลาใกล้ค่ำและก่อนสว่าง โดยการกัดกินเลือดคน ถ้าคนนั้นถูกยุงที่มีเชื้อมาลาเรียกัด ก็จะทำให้ป่วยเป็นไข้มาลาเรียได้ ผลการตรวจเลือดพบว่าท่านเป็นมาลาเรียชนิดไวเวกซ์ ซึ่งสามารถอยู่ในตับได้นานเป็นปี โดยไม่แสดงอาการก็ได้ แต่เมื่อร่างกายอ่อนแอลง เชื้อจะออกมาอยู่ในเม็ดเลือด ทำให้ท่านมีอาการป่วย



หลังจากถูกยุงกัดได้ประมาณ 8-10 วัน ก็จะมีอาการ  
ตัวร้อน มีไข้ หนาวสั่น ห่มผ้าไม่หายหนาว ปวดศีรษะ  
ปวดเมื่อยตามตัว เมื่อไข้ลดเหงื่อจะออกและมีอาการปกติ  
การจับไข้อาจเป็นทุกวัน หรือวันเว้นวัน หรืออาจ  
วันเว้นสองวัน



## อาการของไข้มาลาเรีย



หนาวสั่น



มีไข้ปวดศีรษะ



เหงื่อออก



การเจาะเลือดตรวจจากปลายนิ้วเท่านั้น  
ถึงจะทราบว่ามีเชื้อมาลาเรียไวแวกซ์  
หรือพีวี (Pv.) อยู่หรือไม่  
โดยผลการตรวจเลือดที่มาลาเรียคลินิกแห่งนี้  
พบว่าท่านมีเชื้อชนิดไวแวกซ์ (พีวี)





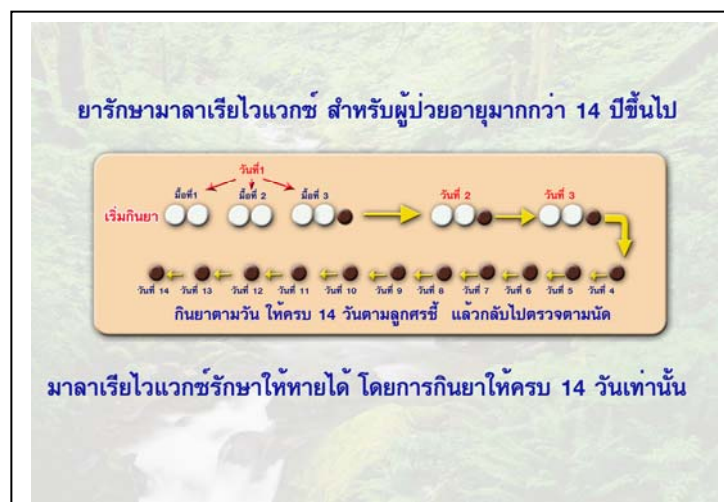
ในกรณีที่ผู้ป่วยอายุมากกว่า 14 ปีขึ้นไป ให้ผู้ป่วยกินยาตามคำแนะนำดังนี้

วันที่ 1  
 มือแรก ให้กินยาเม็ดสีขาว 2 เม็ดทันที  
 มือที่ 2 ให้กินยาเม็ดสีขาว 2 เม็ด หลังอาหารจากมือแรก 4-6 ชม. และควรกินหลังอาหาร  
 มือที่ 3 ให้กินยาเม็ดสีขาว 2 เม็ด และเม็ดสีน้ำตาล 1 เม็ด หลังอาหาร หรือก่อนนอน  
 ภายในวันเดียวกัน

วันที่ 2 (วันรุ่งขึ้น)  
 ให้กินเม็ดสีขาว 2 เม็ดและเม็ดสีน้ำตาล 1 เม็ด พร้อมกัน หลังอาหารเช้า

วันที่ 3  
 ให้กินเม็ดสีขาว 2 เม็ดและเม็ดสีน้ำตาล 1 เม็ด พร้อมกันหลังอาหารเช้าครั้งเดียว  
 เหมือนวันที่ 2 หลังจากนั้น

วันที่ 4 ถึง วันที่ 14  
 ให้กินเม็ดสีน้ำตาล 1 เม็ด หลังอาหารเช้าทุกวัน จนกว่าจะหมด



### ในกรณีที่ผู้ป่วยอายุ 8-13 ให้ผู้ป่วยกินยาตามคำแนะนำดังนี้

**วันที่ 1**  
 มือแรก ให้กินยาเม็ดสีขาว 1 เม็ดทันที  
 มือที่ 2 ให้กินยาเม็ดสีขาว 1 เม็ด หลังอาหารจากมือแรก 4-6 ชม. และควรกินหลังอาหาร  
 มือที่ 3 ให้กินยาเม็ดสีน้ำตาล 2 เม็ด หลังอาหาร หรือก่อนนอน ภายในวันเดียวกัน

**วันที่ 2 (วันรุ่งขึ้น)**  
 ให้กินเม็ดสีขาว 1 เม็ดและเม็ดสีน้ำตาล 1 เม็ด พร้อมกัน หลังอาหารเช้า

**วันที่ 3**  
 ให้กินเม็ดสีขาว 1 เม็ดและเม็ดสีน้ำตาล 1 เม็ด พร้อมกันหลังอาหารเช้า  
 เม็ดสีน้ำตาล 1 เม็ด หลังอาหารเช้าครั้งเดียว เหมือนวันที่ 2 หลังจากนั้น

**วันที่ 4 ถึง วันที่ 14**  
 ให้กินเม็ดสีน้ำตาล 1 เม็ด หลังอาหารเช้าทุกวัน จนกว่ายาจะหมด

### ยารักษามาลาเรียไวแวกซ์ สำหรับผู้ป่วยอายุ 8-13 ปี

กินยาตามวัน ให้ครบ 14 วันตามลูกศรชี้ แล้วกลับไปตรวจความดัน

**มาลาเรียไวแวกซ์รักษาให้หายได้โดยการกินยาให้ครบ 14 วันเท่านั้น**

### ในกรณีที่ผู้ป่วยอายุ 3-7 ปี ให้ผู้ป่วยกินยาตามคำแนะนำดังนี้

**วันที่ 1**  
 มือแรก ให้กินยาเม็ดสีขาว 1 เม็ดทันที  
 มือที่ 2 ให้กินยาเม็ดสีขาว 1 เม็ด หลังอาหารจากมือแรก 4-6 ชม. และควรกินหลังอาหาร  
 มือที่ 3 ให้กินยาเม็ดสีขาว 1 เม็ด และ เม็ดสีน้ำตาล 1 เม็ด หลังอาหาร หรือก่อนนอน ภายในวันเดียวกัน

**วันที่ 2 (วันรุ่งขึ้น)**  
 ให้กินยาเม็ดสีขาว 1 เม็ด และ เม็ดสีน้ำตาล 1 เม็ด พร้อมกันหลังอาหารเช้า

**วันที่ 3**  
 ให้กินยาเม็ดสีขาว 1 เม็ด และ เม็ดสีน้ำตาล 1 เม็ด พร้อมกันหลังอาหารเช้าครั้งเดียว เหมือนวันที่ 2 หลังจากนั้น

**วันที่ 4 ถึง วันที่ 14**  
 ให้กินยาเม็ดสีน้ำตาล 1 เม็ด หลังอาหารเช้าทุกวัน จนกว่ายาจะหมด



ขณะที่ท่านกินยารักษาไข้มาลาเรีย ท่านอาจมีอาการเวียนศีรษะ อ่อนเพลีย คลื่นไส้ อาเจียน บัสสาวะอาจมีสีเข้มขึ้น อาการเหล่านี้จะแก้ไขได้โดยให้กินยาหลังอาหารทันที หรือกินอาหารไปก่อน แล้วจึงกินยาตาม เพื่อไม่ให้ท้องว่าง พร้อมทั้งท่านควรสังเกตสีของบัสสาวะด้วย



เมื่อกินยาครบ 14 วันแล้ว วันถัดมาต้องกลับมาตรวจเลือดซ้ำอีกครั้ง เพื่อให้แน่ใจว่าไม่มีเชื้อมาลาเรียในร่างกายแล้ว  
 ในวันที่ .....ให้กลับมาตรวจเลือดอีกครั้ง  
 อย่าลืมกินยาว่าท่านต้องกินยาตามที่ให้ไป  
 ให้ครบทุกมื้อ

**กินยาครบ 14 วันแล้ว**  
**ให้กลับมาตรวจตามนัดทุกครั้ง**




ประวัติการรักษาผู้ป่วย			
ชื่อผู้ป่วย	คณะ	อายุ	ปี พ.ศ.
ชื่อแพทย์	กลุ่มงาน	อายุ	ปี พ.ศ.
ชื่อรพ.	จังหวัด	จังหวัด	จังหวัด
วันที่	วันที่รับ	อาการ	ผลตรวจ

นำบัตรนี้มาด้วยทุกครั้งไปตรวจ

เราจะป้องกันไม่ให้คนอื่นติดได้ โดยเราต้องนอนในมุ้งหรือมุ้งที่ชุบสารเคมี  
 ช่วงหัวค่ำและกลางคืน ถ้าจำเป็นต้องอยู่นอกมุ้งควรใช้ยาทากันยุง จุดยากันยุง หรือสุมไฟไล่ยุง และควรยินยอมให้เจ้าหน้าที่ พ่นบ้านด้วยสารเคมีถ้าจำเป็น



## PAPER BAG ILLUSTRATING DIRECTIONS FOR DRUG PRESCRIPTION

### ยารักษาไข้มาลาเรียไวแวกซ์ (ฟีวี)

หน่วย..... ลำดับที่.....

ชื่อผู้ป่วย.....อายุ.....ปี

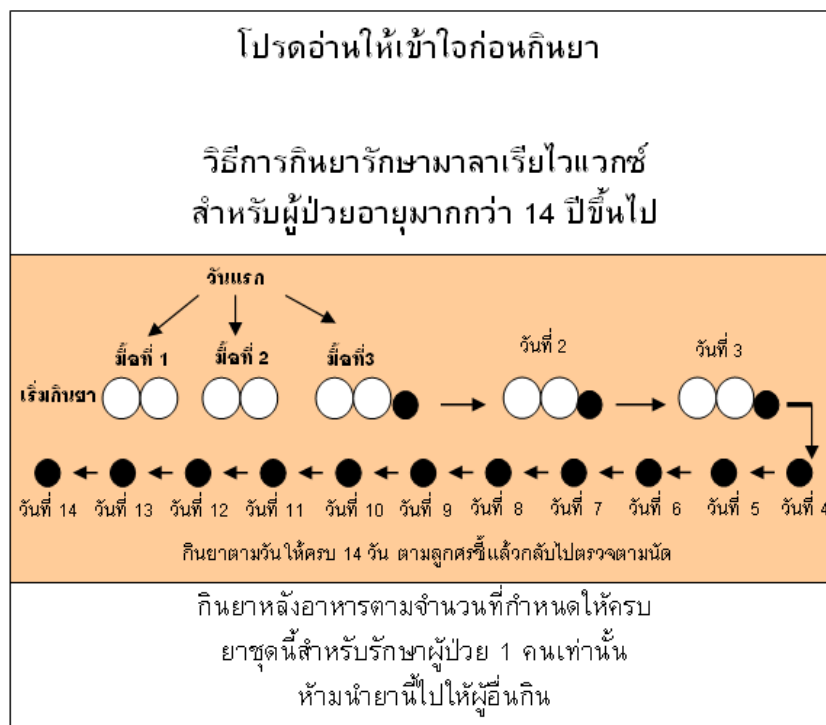
วันที่เริ่มกินยา.....

วันที่กินยาครบ.....

วันที่กลับไปตรวจตามนัด.....

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สำนักงานป้องกันควบคุมโรคที่ 10 ร่วมกับคณะเวชศาสตร์เขตร้อน  
มหาวิทยาลัยมหิดล



# ยารักษาไข้มาลาเรียไวแวกซ์ (พีวี)

หน่วย..... ลำดับที่.....

ชื่อผู้ป่วย.....อายุ.....ปี

วันที่เริ่มกินยา.....

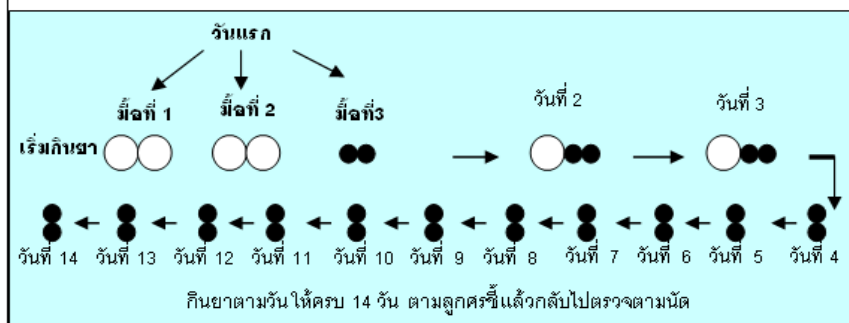
วันที่กินยาครบ.....

วันที่กลับไปตรวจตามนัด.....

สำนักงานป้องกันควบคุมโรคที่ 10 ร่วมกับคณะเวชศาสตร์เขตร้อน  
มหาวิทยาลัยมหิดล

## โปรดอ่านให้เข้าใจก่อนกินยา

### วิธีการกินยารักษาไข้มาลาเรียไวแวกซ์ สำหรับผู้ป่วยอายุ 8 - 13 ปี



กินยาหลังอาหารตามจำนวนที่กำหนดให้ครบ  
ยาชุดนี้สำหรับรักษาผู้ป่วย 1 คนเท่านั้น  
ห้ามนำยาไปให้ผู้อื่นกิน

## ยารักษาไข้มาลาเรียไวแวกซ์ (พีวี)

หน่วย..... ลำดับที่.....

ชื่อผู้ป่วย.....อายุ.....ปี

วันที่เริ่มกินยา.....

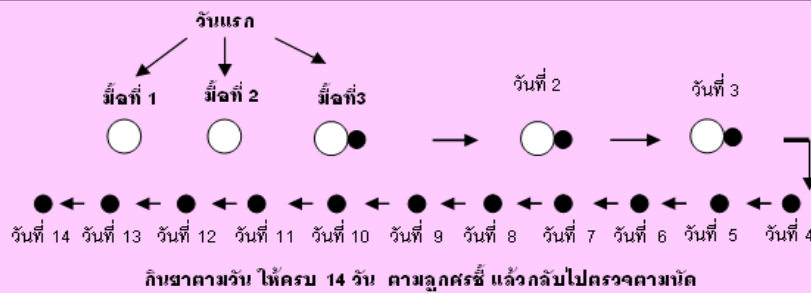
วันที่กินยาครบ.....

วันที่กลับไปตรวจตามนัด.....

สำนักงานป้องกันควบคุมโรคที่ 10 ร่วมกับคณะเวชศาสตร์เขตร้อน  
มหาวิทยาลัยมหิดล

### โปรดอ่านให้เข้าใจก่อนกินยา

#### วิธีการกินยารักษาไข้มาลาเรียไวแวกซ์ สำหรับผู้ป่วยอายุ 3 - 7 ปี



กินยาหลังอาหารตามจำนวนที่กำหนดให้ครบ  
ยาชุดนี้สำหรับรักษาผู้ป่วย 1 คนเท่านั้น  
ห้ามนำยานี้ไปให้ผู้อื่นกิน

**APPENDIX D  
THE INFORMED CONSENT FORM**

**Research Topic:** Vivax Malaria Patients and Their Drug Adherence in Northern Thailand

**Date of Consent:** .....

Before signing in this form to participate in the study, I have been completely explained by the researcher concerning the objectives, methodology, harmfulness or related symptoms derived from the study, and the significance of the study. I understand clearly in all aspects.

The researcher assures that all of my required questions will be answered openly until I satisfy and understand. Moreover, I can give up participating in the study whenever I want. I am willing to participate in the study and if I give up, it will not affect me in any circumstances.

Every information given to the interviewer during the interview will be kept strictly confidential. All of information will be kept in a secure place and use these for research only. If you have any questions regarding this study please contact:

Ms. Nardlada Khantikul address: The Office of Disease Prevention and Control 10, 447 Lamphun Road, Wath-Geth Sub-district, Muang District, Chiang Mai Province.  
Tel: 053-271021, 053-275775, Fax: 053-271020, Mobile: 01-2876417

The researcher assures that if there is any harmfulness occurred during the study an affects me, I will be supported financially and I will get paid if I am hospitalized with standard cost and disability compensation if possible.

The researcher assures that if there is additional information affects the study, I will be informed openly. After, I have read and understood all information above obviously, I then sign in the form with willingness.

Interviewee:  
Name: .....  
Signature: .....  
Date: .....

Witness:  
Name: .....  
Signature: .....  
Date: .....

**APPENDIX E**  
**DOCUMENTARY PROOF OF ETHICAL CLEARANCE**

Approval Number: MUTM 2006-023



**CERTIFICATE OF APPROVAL**  
From  
Ethics Committee  
Faculty of Tropical Medicine, Mahidol University, Bangkok

**Title of Project :** Vivax malaria patients and their drug adherence in Mae Hong Son  
Province, Northern Thailand

**Approval for :** Revised protocol submitted on 31 May 2006

**Principal Investigator:** Miss Nardlada Khantikul

**Institution :** Department of Social and Environment Medicine  
Faculty of Tropical Medicine  
Mahidol University  
420/6 Ratchawithi Road, Bangkok 10400

**Signature of Chairperson, Ethics Committee :** Wijit Fungladda  
(Assoc. Prof. Wijit Fungladda)

**Signature of Dean :** Pratap Singhasivanon  
(Assoc. Prof. Pratap Singhasivanon)

**Date of Approval :** 8 JUN 2006

**Date of Expiration :** 8 JUN 2007

## **BIOGRAPHY**

<b>NAME</b>	Miss Nardlada Khantikul
<b>DATE OF BIRTH</b>	May 6, 1965
<b>PLACE OF BIRTH</b>	Chiang Mai, Thailand
<b>INSTITUTIONS ATTENDED</b>	1990, Diploma of Nursing and Midwifery (Equivalent to Bachelor of Science in Nursing) Bangkok Nursing College, Thailand 1997, Master of Education (Health Education) Srinakharinwirot University, Thailand
<b>POSITION HELD</b>	Public Health Official
<b>OFFICE ADDRESS</b>	Office of Disease Prevention and Control 10 447 Lamphun Road, Wat-Geth Sub-District, Muang District, Chiang Mai Province 50000, Thailand E-mail: nardlada@gmail.com